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SEPTEMBER 1943

HARDENABILITY TESTING OF STEELS—

SECRET WEAPON OF WAR PRODUCTION

WHEN the Japs struck at Pearl Harbor, American metallurgists were ready with a powerful new weapon – hardenability testing – which was destined to play a vital role in winning the battle of production by accelerating and expediting the selection, procurement, substitution, and production of alloy steels for both war materiel and civilian equipment.

Hardenability testing is serving effectively on our production war front in three principal ways:

1. It has facilitated the substitution in many applications of NE or carbon steels for those containing larger amounts of critical alloying elements;

2. It accelerates the specification of steels for new equipment on which no prior experience is available; and

3. It provides a quick check on the hardenability of various heats of steel at the mills.

Born only within the past five years, the new technique has been subjected to constant and intensive individual and cooperative research by leading metallurgists. The Iron and Steel Division of the SAE Standards Committee has been in the thick of this development almost from the start. At the Nov. 14, 1939, meeting of the division, a Subdivision on Hardenability Charts, made up of both producers and users, was organized (under the Chairmanship of the late E. F. Davis, Borg-Warner Corp., an expert on heat treating) to develop a series of hardenability charts to supplement the existing physical property charts. This subdivision was later re-named the Subdivision on Hardenability Testing to reflect more accurately the broadening scope of its activities.

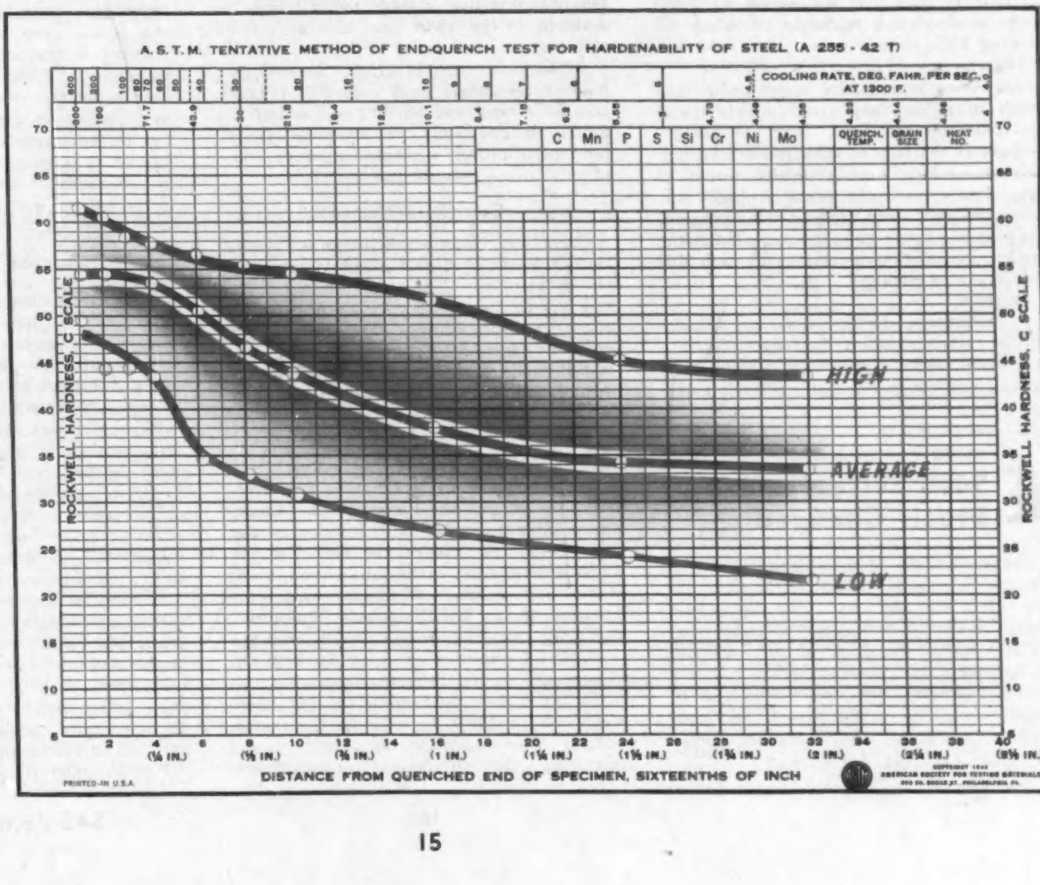
Symposium Marks Milestone

More than a year's active work by this subdivision culminated in a symposium[1] on the subject at the SAE 1941 Annual Meeting with the objective of crystallizing the various methods then in use into a standard method of test. Participating in this symposium were such leading authorities as W. E. Jominy, F. E. McCleary, and R. Wuerfel of Chrysler

turn to page 22

[1] See SAE Transactions, July, 1941, pp. 266-293: "Standardization Sought in Determining Hardenability of Steels."

What Hardenability "Ranges" Look Like



Typical hardenability "range" representing over 80 heats of a given steel specification. The "high" and "low" borders of the range correspond to the upper and lower limits of allowable composition for the steel.

This curve is drawn on the standard ASTM form which employs arithmetical coordinates. The ASTM form is being used by the SAE-AISI Committee on Steel Hardenability Data, whose current activities are described in the accompanying article. (The same "range" drawn on the standard SAE form, which uses logarithmic abscissa, is shown on p. 22.)

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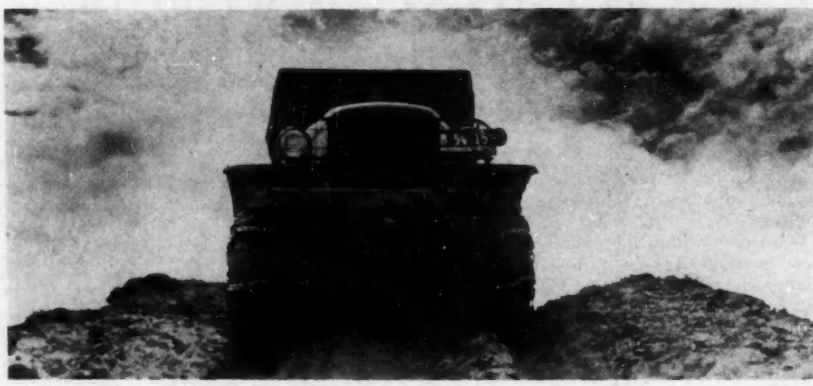
SAE Test Method To Disclose Climb Power of Army Trucks



TO BETTER synchronize Army vehicles with tactical operations, the SAE War Engineering Board has been asked to develop a test procedure with the Coordinating Research Council to be used by representatives of CRC in testing climbing abilities of trucks over a run at Tioga Pass, Sierra Nevada Mountains.

Capt. F. E. Neef, Jr., Tank-Automotive Center, Army Ordnance Department, met on June 29 with nine automotive test engineers to develop a workable procedure for making high altitude tests.

Objective:

An Army commander must know how much of a load any given vehicle under his command can haul "over the hump." Because of shortage of vehicles on most battlefronts, vehicles are generally forced to haul double payloads, often at high altitudes and over steep grades. This program is designed to give commanding officers the needed information in respect to high-altitude climbing ability.

Program:

1. Performance factors of various vehicles will be calculated before the tests;

2. Performance factors will include rated payload without towload at sea level; maximum gradability at sea level, at 4000, 8000, and at 12,000 ft where similar grades are used; and try for a 15% grade at 10,000 ft.

3. Tests will be made with no load, full rated payload, and double payload; a determination of a percent of grade-to-load curve will be made for each vehicle. Successive changes will be made in carburetor settings. Studies will be made of overall cooling, percolation, vapor lock on continuous operation over a long, tough course, in addition to the short run tests at various elevations.

African campaign experience showed that many commanders were unable to estimate accurately time and amount of gasoline required to haul loads over mountain passes, preventing proper synchronization of complicated troop movements.

Committee Named

Capt. Neef, chairman of the group, named Don O. Stone, Willys-Overland Motors, Inc.; H. H. Hopkins, Continental Motors Corp., and W. E. Zierer, Chrysler Corp., to write up the test procedures. The meeting was called by James M. Crawford, a member of W.E.B. and chairman of the CRC Equipment Division, at the request of Capt. Neef.

NE 9400 Series Steels Changed

Changes in the chemical composition of National Emergency (NE) Steels were put into effect on Aug. 15, 1943, to permit greater flexibility in the use of scrap, particularly in the handling of turnings and borings; to make possible higher recovery of molybdenum from steel scrap; and to remove objections on the part of steel consumers to the use of steels containing higher than normal quantities of silicon.

The modifications were made by representatives of the Metallurgical and Conservation Branch of the Steel Division of the War Production Board; the Office of the Chief of Ordnance, Technical Division, U. S. Army; and members of the Iron and Steel Division of the SAE Standards Committee, the SAE War Engineering Board, and the Technical Committee on Alloy Steel of the American Iron and Steel Institute.

To accomplish these ends, the NE 9400 series was modified by reducing the silicon content from 0.40/0.60 to 0.20/0.35; by increasing the chromium content from 0.20/0.40 to 0.30/0.50; and increasing the nickel content from 0.20/0.50 to 0.30/0.60. These changes will not materially change the hardenability characteristics of the steels, and so should not adversely affect the testing programs now in progress.

Compositions Withdrawn

The following compositions have been withdrawn: NE 8020, NE 8442, and the entire NE 9600 series.

The following compositions have been added: NE 9261, NE 9425, and NE 9545.

The chromium content of NE 9262 was revised to read 0.25/0.40.

Technical Aid For
Men With Wrenches

THE man with the wrench – not the metallurgist or designer – actually determines the strength of bolts and studs, the SAE War Engineering Board has been told by its Subcommittee on Nut Torque Data in a progress report received recently. This man with the wrench, the report urges, needs explicit instructions in the technique of tightening nuts. The provision of such instructions in connection with aircraft production is the objective of this subcommittee's studies.

Data for Comparison

The subcommittee, of which General Motors' J. O. Almen is chairman, is accumulating data, by which comparisons may be made of the three chief methods of nut tightening. The three methods are: (1) by means of a wrench calibrated to indicate the torque being applied to the nut – and this is the most widely used although its accuracy is questioned because of the large variability of friction; (2) by specifying the angular rotation of the nut without reference to the torque required to rotate the nut; and (3) by measuring the extension of the bolt or stud as by micrometer – a method limited in application to conditions where both ends of the bolt or stud are accessible.

Program Worth-While

The few scattered test results already at hand indicate that a program designed to find ways of reducing the variability of friction of nuts – and thus make torque wrench application more trouble-free – holds promise of being worth-while, the report says.

Not only must nuts be properly tightened on assembly, it points out, but assurance must be had that tightness is maintained in service. Where assemblies include gaskets or soft-plated coatings, there is a strong possibility that yielding will occur with subsequent loss of tension – particularly when short studs are used. A very slight loss of dimension of the bolted parts by yielding, corrosion or displacement is sufficient to decrease the stud tension and cause early fatigue failure. Consequently, the subcommittee may wish to make recommendations about gasket materials, plated coatings, washers and other yielding parts where these are used in combination with short studs.

Further extensive tests are contemplated

by a number of companies for the benefit of the committee, including tests by Chrysler, Allison, Pratt & Whitney, Ford, Wright Aeronautical, Packard and General Motors Research.

Piston, Ring Nomenclature Project Nears Completion

Rapid progress on a project for standardizing the nomenclature of pistons, piston rings, and their parts indicates that this work will be completed soon. The undertaking was proposed to the Society's Standards Committee because the large variety of piston and ring designs developed during the past few years has caused much nomenclature confusion to design, production, and maintenance engineers.

52 Designations

Fifty-two designations or terms, two with sub-designations, were proposed and sent to engine, automobile, truck, bus, piston, piston ring and other interested manufacturers —a total of 54 companies.

Early returns indicated considerable agreement. Most engineers expressed enthusiasm over the project. Several preferred alternate terms to designate certain parts. These suggestions are being thoroughly reviewed so substantial agreement will result. When approved by the Standards Committee, the list of terms will be made available probably by publication in the 1944 Edition of the SAE Handbook.

FELTS

TABLE 1—AUTOMOTIVE FELT CLASSIFICATION

S.A.E. No.	Trade Designation	Nominal Fiber Content[1]		Color
		Wool, Per Cent	Cotton, Per Cent	
F-1	Back Check	100	....	White
F-2	Back Check	100	....	Any Color
F-3	Back Check	95-[illegible]	5	Gray

Felt

Revision of SAE Standard Under Way

Revisions of the SAE Standard (p. 520, 1943 SAE Handbook), including new felts and their required properties as related to the critical materials situation, are under way by the Felt Subdivision of the SAE Parts & Fittings Division.

Manufacturers have been asked by the Subdivision to submit new materials, which will be classified and included, upon approval, in the SAE grouping.

H. R. Wolf, General Motors Corp., is chairman of the Subdivision which reports to the Division headed by Arthur Boor, chief engineer, Monroe Auto Equipment Co.

The first SAE Felt Standard for automotive use was adopted 20 years ago. Then, as now, the work is coordinated with the American Society for Testing Materials in respect to standard test methods of the fabric and tests for the presence of fibers other than wool.

F-50	Ball Bearing Felt	100	....	White
F-51	Ball Bearing Felt	100	....	Gray
F-55	Lining	80-85	15-20	Gray or Black

[1] The nominal fiber content indicates the percent of wool and cotton fiber used in fabricating the several [illegible] includes traces of other fibers and impurities present in the raw material. For example

SAE Group Reports on Methods And Redesign to Conquer Dust

SWINGING into the second phase of an industry-wide study to improve the performance of dust cleaners for Army vehicles, five members of the SAE War Engineering Board's Dust Technical Committee have spent a total of 60 days at the Phoenix (Ariz.) Proving Ground of the Army Ordnance Department to see at first hand the results of the preliminary recommendations of the committee.

Several months ago Major-Gen. G. M. Barnes, chief of the Technical Division of the Army Ordnance Department, requested the SAE-W.E.B. to make a study and report recommendations for improving dust cleaners.

During the North African campaign, dust was often so thick that tanks and armored vehicles ran into those ahead because visibility was zero.

Multiplied hundreds of times, a column of Army vehicles often raises enough dust to make visibility zero

Collected Test Data

Early steps of the project included the collection of test data from dust filter manufacturers, tractor companies, and automobile proving grounds to determine the best current design practices of the industry. Immediate and full cooperation of all manufacturers resulted in:

1. Adoption of a new carburetor-mounted oil bath type of cleaner for motor transport vehicles. This was designed jointly by Ordnance and automotive industry engineers.
2. Use of removable filter elements.
3. Equipping vehicles with pre-cleaners. For example, a tractor at Walla Walla, Washington, took in 75 lb of volcanic ash dust in 24 hr.
4. Redesign of the dip stick tube to prevent accumulation of dust which falls into the engine crankcase.
5. Carburetor throttle and choke shafts were sealed, but excessive friction was not allowed. Parts must not be affected by temperature of 300 F. Carburetors should be completely sealed to withstand 5 psi water pressure, or 10 in. of hg vacuum without leakage, the report said.
6. Flexible controls were provided with bellows seals at each end and control sheathing was made watertight. A neoprene, or equivalent, bellows-boot was recommended.
7. Hardened shafts and oil-less bearings were used on all exposed control shafts.
8. Radiator specifications included provisions for not more than 8 fins per in., tubes should not be staggered; there should be not more than three tubes front to rear, and tubes should not be spaced less than ½ in. center to center. This was to permit free flow of air and prevent clogging of air flow passages.
9. Ignition distributors were sealed.
10. Foot and lighting switches were sealed against dust, either by a boot or some other means.
11. Electrical instruments were weatherproofed and dust-tight.

A list of installation and maintenance items were also included in the report.

According to several committee members and some of the 20 British and American military and civilian consultants, one of the greatest achievements of the project was to steer all manufacturers in the proper design channels.

Committee Members

To date, members of the committee who have been assigned for two-week periods at the Phoenix Proving Ground to observe tests include R. L. Weider, White Motor Co.; L. F. Overholt, International Harvester Co.; B. Steenson, Chrysler Corp. (for Thomas M. Ball); J. M. Davies, Caterpillar Tractor Co., and William S. James, Studebaker Corp.

John G. Wood, Chevrolet Motor Division, General Motors Corp., is chairman of the Dust Technical Committee, which is composed of the above and E. H. Shepard, also of Chevrolet. The Dust Steering Committee is headed by Ralph R. Teetor, vice-president of Perfect Circle Co. Members are J. M. Crawford, chief engineer of Chevrolet; H. S. Eberhard, vice-president of Cater-

pillar Tractor Co.; Mr. James; A. W. Scaratt, vice-president of International Harvester Co., and James C. Zeder, chief engineer of Chrysler Corp. and chairman of the SAE War Engineering Board.

The work at Phoenix is being correlated by SAE Member J. M. Muzzy, manager of the Ordnance (General Motors) Proving Ground, and each of the committee's representatives will enter data in the daily log sheets covering details of the test program.

Included in the early studies of the committee was a detailed report of the British Army's experience with dust cleaners in the African campaign. The reports of the committee were correlated with carburetor engineers of SAE aircraft engine standards committees who have faced similar problems in their work for the Army-Navy Aeronautical Board.

Pressing Need

Brig.-Gen. John K. Christmas, assistant chief, Tank-Automotive Center, told one of the committee meetings that better protection against dust was one of the most pressing needs for successful operation of mechanized war equipment. "Dust is as real an enemy to our mechanized equipment as the enemy himself, and it will require the combined efforts of all interested companies to defeat it."

He directed three ranking officers of the T-AC to represent the Ordnance department in connection with the program: Lt.-Col. E. F. Norelius, tanks and combat vehicles; Col. E. S. Van Deusen, motor transport vehicles, and Lt.-Col. J. M. Colby, development work.

New SAE Engine Test Codes

THE new Diesel Engine Test Code and Gasoline Engine Test Code adopted by the Society in revision of the old testing forms that have not been revised for several years, are completed and in stock.

These codes consist of general instructions on testing procedure, instrumentation and computation of results. The extended mechanical information sheets provide for recording all such data on the engine under test. The log sheets are in suitable form for laboratory use and the modernized curve sheets include six sheets for the Gasoline Engine Code and four sheets for the Diesel Engine Code covering ranges of engine sizes ordinarily used in automotive applications.

These codes are available singly or in quantities from the Society.

Since the Gasoline Engine and Diesel Engine Codes were originally adopted in 1917 and 1931 respectively, experience shows they have been very widely used as permanent laboratory test records and with sales literature by the automotive manufacturers.

Current Trends In Propeller Design

by R. P. LAMBECK
Hamilton Standard Propellers

Recently the SAE Aeronautical Division's Committee P-5 on Dual-Rotation Shafts completed a standard on dual-rotation propeller shaft ends AS-91 with the cooperation of the Division's Committee (E-2) on Engine Accessory Drives. This standard permits interchangeability of variable-pitch, dual-rotation propellers for shaft sizes from the 40-60 through the 60L-80 combination.

Committee discussion leading to issuance of this important standard ranged broadly throughout the field of aircraft propeller design before final agreement was reached.

As background for its further deliberations, the Dual-Rotation Shaft group has evolved an integrated summary of many of the points made in these discussions together with certain historical data likely to be useful for reference purposes.

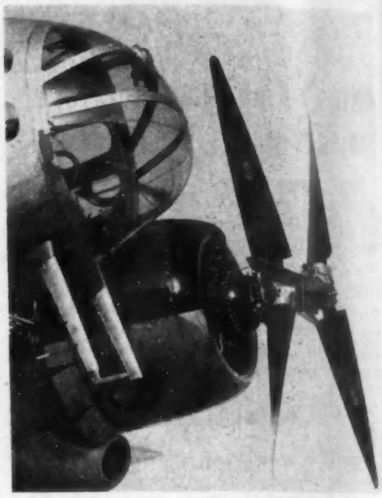
Prepared by Committee P-5 Chairman R. P. Lambeck of Hamilton Standard Propellers, this summary has just been released for publication in the SAE Journal. *Other members of this Committee are: C. W. Chillson, Curtiss-Wright Corp., Propeller Division; W. L. Greene, Engineering & Research Corp., and T. B. Martin, Aeroproducts Division, General Motors Corp.*

THE dual-rotation propeller is the culmination of the period of continuous development in aircraft propellers that began with the first successful flights. In this period, the advances in aerodynamic and in engine development have been reflected in each stage by corresponding advances in propeller design. While this history is well known to those closely connected with the aircraft industry, it is believed that a brief review of the background of aircraft propeller development will be of interest to all whose concern with the aircraft industry has been more recently acquired.

Incorporate Many Improvements

The fixed-pitch wood propellers used in the early days of aviation were crude by present standards, as were the airplanes and engines of that time. Their modern counterparts, the fixed-pitch wood propellers that are commonly used on light planes, incorporate improvements in blade planform and airfoil sections that add appreciably to their efficiency and, in addition, the improvements in processing and manufacturing technique have greatly enhanced their durability.

The advantages of the fixed-pitch wood propeller lie in its simplicity: it is light and inexpensive. Also, wood is not subject to failure from fatigue, as are metals. On the debit side is the low modulus of elasticity of wood, which results in prohibitive deflections in propeller blades unless they are relatively thick. While blades with thick sections are not undesirable for light planes, they can cause marked efficiency losses due to compressibility in installations where higher engine horsepowers require the use of larger propellers with higher tip speeds.



First American-built dual-rotation propeller to be successfully test-flown was this Hamilton Standard unit

The fixed-pitch aluminum propellers of the twisted-slab type and of one-piece forged construction that followed the wood propeller in development enabled thinner blade sections to be employed. Although they were heavier than wood propellers, the metal propellers were generally more efficient and more rugged. The development of forged aluminum blades also led to the adjustable-pitch propeller in which the blades are retained in a split steel hub and can be adjusted to any desired angle while the airplane is on the ground. The main advantage of the adjustable-pitch propeller is in its adaptability to various installations having slightly different engine horsepower or flight characteristics, such that a slightly different blade angle is needed in each case to provide the best average performance. In the same way, it is possible to emphasize various flight conditions in any installation by adjusting the propeller to the best blade angle for take-off and climb, top speed, economical cruising, or any other single condition.

General Disadvantage

The fact that only one flight condition at a time can be emphasized with an adjustable-pitch propeller brings out the general disadvantage of all propellers that must operate at fixed pitch through all of the varying conditions of flight. At the start of take-off, a low blade angle is required to permit the engine to turn up to its full rpm and therefore deliver its maximum horsepower at full throttle. As the airplane speed increases, however, the blade angle must increase also so that the engine will not overspeed, forcing the pilot to throttle back and lose some of the available engine horse-

power. In fixed-pitch propellers, it is customary to choose some pitch that is a compromise between the low angle required at the start of take-off and the high angle needed at top speed. This leads to a loss of engine horsepower both during take-off and climb, where the engine is unable to reach its full rated rpm and, therefore, delivers less than its maximum horsepower, and at top speed where the pilot must throttle back to prevent overspeeding the engine. In addition, the use of high angles of attack during take-off and climb results in loss in efficiency of the propeller and a further loss in the horsepower actually delivered as thrust.

For low-performance aircraft in which the top speed is not high, the range of blade angles required is not very wide and the losses due to the use of fixed-pitch propellers are comparatively small. They become increasingly important, however, as the size and design speed of aircraft increase; the speed range, load carrying capacity and high-altitude performance of modern airplanes would be unattainable without variable-pitch propellers.

Early Variable-Pitch Propellers

The first variable-pitch propellers, which came into use about ten years ago, could be adjusted in flight to either of two predetermined settings. The low pitch angle was generally set to give good take-off and climb performance and the high pitch to give efficient performance at top speed or some similar level-flight condition. The total angle range available was at first only a few degrees, but this was adequate for the aircraft of that time and was later increased to satisfy the requirements of improved aircraft types.

The adoption of automatic governing for the propeller and the development of improved propeller types having a blade angle range adequate to permit feathering followed shortly. The governor, driven at some ratio of engine speed, controls the pitch-changing mechanism of the propeller so as to maintain constant propeller and engine speed during all maneuvers. It can be reset at will by the pilot, so that any combination of engine speed and manifold pressure desired for a given flight condition can be attained. While these propellers are inevitably heavier than the earliest fixed-pitch types, the gains in performance that are realized by far offset this disadvantage.

Standard Equipment

Propellers incorporating feathering provisions are now standard equipment on all multi-engined commercial and military aircraft. In feathering, the blades are turned to an extreme high blade angle so that they lie edgewise to the slipstream and there is no tendency to windmill. This feature is used to halt the rotation of a damaged engine. The feathering of the propeller materially reduces its drag, making it possible for the airplane to maintain flight more successfully on the remaining engine or engines. Also, by stopping engine rotation, it prevents further damage to the engine, or to the airplane structure due to any vibration that may be set up by cranking the disabled engine.

While the propellers used on modern high-performance single-engined aircraft are without feathering provisions, the propeller types used are the same as those on multi-engined aircraft and nearly as wide a blade-

SAE National Tractor Meeting

Courtesy Republic Steel Corp.

Schroeder Hotel, Milwaukee — **Sept. 23-24**

THURSDAY, SEPT. 23

MORNING

Elmer McCormick, John Deere Tractor Co., Chairman

Predicting Tractor Bearing Life
–John Borland, Timken Roller Bearing Co.

Discussion

–B. W. Keese, Wisconsin Axle Division, Timken-Detroit Axle Co.
–L. A. Bixby, Clark Equipment Co.

AFTERNOON

O. R. Schoenrock, J. I. Case Co., Chairman

Post-War Fuels

–T. H. Risk, Ethyl Corp.

Prepared discussions

■

DINNER

7:00 p.m. — Thursday

C. G. Krieger, Director, Farm Machinery & Equipment Division, WPB, Chairman

J. B. Fisher, Waukesha Motor Co., Toastmaster

Wartime Farm Machinery and Food Production

–M. Lee Marshall, Deputy Administrator, War Food Administration

FRIDAY, SEPT. 24

MORNING

L. B. Sperry, International Harvester Co., Chairman

Post-War Tires

–E. F. Brunner, Goodyear Tire & Rubber Co.

Prepared discussions

■

AFTERNOON

L. S. Pfost, Massey-Harris Co., Chairman

Activities of SAE Tractor War Emergency Committee

–A. W. Lavers, Minneapolis Moline Power Implement Co.

Special Addition Agent Steels

–R. B. Schenck, Buick Motor Division, General Motors Corp.

angle range may be needed to satisfy all flight requirements. In a dive condition, for example, the blade angle needed to prevent overspeeding of the engine may be within about 20 deg of that required for feathering.

The variable-pitch propellers in current production most commonly employ blades of forged aluminum or hollow steel retained in a steel hub. With these blade materials it is possible to provide the thin airfoil sections needed to prevent excessive compressibility losses due to the high propeller-tip speeds inherent in modern installations. As noted, these materials are susceptible to fatigue due to vibratory stress. However, the development of the electrical-resistance type of strain gages that can be affixed to the blades to measure the actual vibration stresses encountered in flight has brought about the virtual elimination of this earlier hazard. The vibration characteristics of each airplane-engine-propeller combination must now be approved before it is placed in service.

Block Improvement

Together with the increase in angle range of variable-pitch propellers has come a progressive improvement in the rate of blade angle change provided by the pitch changing mechanism. This is very important in high-speed, highly maneuverable aircraft where "dogfighting" tactics place great demands on the ability of the propeller to prevent serious overspeeding upon suddenly entering a dive, and to regain normal operating angles to deliver full thrust for maximum speed climb or level flight at the termination of the dive. The rate of acceleration of high-horsepower engines due to rapid changes in throttle setting is also extreme, and particularly rapid rates of pitch change are needed to prevent overspeeding of the engine due to throttle manipulation.

In the foregoing discussion, little has been said of the factors which influence the choice of propeller diameter, blade shape, or the number of blades needed to deliver efficiently as thrust the power developed by the engine. Since some understanding of these factors is needed before the reasons for the adoption of dual-rotation propellers become clear, it will be necessary to explore these factors briefly. As a starting point in this exploration, consider the case of an installation which is at present operating efficiently with propellers having blades of medium width and thickness, and assume that an improved version of this airplane is to employ engines having a higher horsepower rating. The following avenues are then open to the propeller designer:

Design Possibilities

1. The same propeller, operating at higher angles of attack to absorb the increased power, can be used. Since the lift/drag ratio of an airfoil section (and therefore its efficiency) becomes lower as the lift coefficient (intensity of loading) of the section increases, this solution will entail a loss in efficiency of the propeller. In addition, tip losses due to compressibility are more severe at high angles of attack due to the high local velocities produced on the airfoil section.

2. The thickness of the blades can be increased or airfoil sections having higher lift coefficients can be used. This permits the propeller to deliver a higher thrust while operating at lower angles of attack, but losses similar to those mentioned in the first case are found, and for the same reasons.

3. Propellers of larger diameter can be used. This is generally an acceptable solution, provided the propeller rotational speed is correspondingly reduced so that the propeller-tip speed is limited to a reasonable value. The use of a larger propeller may be impossible, however, due to ground clearance limitations or the proximity of the nacelles to the fuselage or to each other. Also, since torque is proportional to horsepower divided by rpm, it is apparent that a large propeller operating at low speed may have so large a torque reaction that the stability of the airplane is critically affected.

4. The solidity of the propeller can be increased by using wider blades. This permits the propeller to absorb the increased horsepower without increasing the angle of attack of the blades, provided the increase in horsepower is moderate. The efficiency losses mentioned in case 1, above, are not introduced when wider blades are used. While some other losses may accompany the use of wider blades in certain instances, they are generally minor compared to those due to high angles of attack or high lift coefficients.

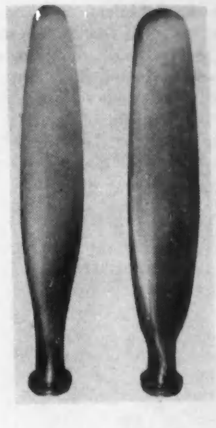
5. The solidity of the propeller can be increased by increasing the number of blades. In propellers, the disturbance in the air stream caused by one blade affects the efficiency of the following blade, and this effect is accentuated as the number of blades increases. Three-bladed propellers are, therefore, inherently less efficient than two bladed propellers, and so forth. However, the losses due to increasing the number of blades are only of the same order of magnitude as those due to using blades of increased width, so this last solution is in many cases the most appropriate.

Changing Requirements

The above conditions were discussed in terms of the changing requirements that occur when engine horsepower is increased. It should be noted that the same changes are required as the effectiveness of engine supercharging is improved, even though the horsepower delivered by the engine at sea level remains the same. This effect is difficult to overemphasize. As an example, consider a 2000 hp engine that is supercharged so that its sea-level horsepower is maintained at 28,000 ft, where the density of the air is only about four-tenths of that at sea level. A propeller able to absorb 2000 hp efficiently at that level would absorb 5000 hp at the same angle of attack at sea level. The effect of increasing the altitude rating of an engine is, therefore, seen to be the same as increasing engine horsepower so far as the demands on the propeller are concerned.

An Example

An excellent illustration of this effect is gained from the Flying Fortress that originally employed propellers of average blade width, which were efficient at moderate altitudes. The altitude rating of the engines in this installation was later substantially increased by an improvement in supercharging, but it was found that the additional horsepower available at high altitude was completely nullified by the loss in efficiency of the blades, which were forced to operate at high angles of attack. The condition was corrected in this case by changing to blades of substantially wider planform which operated at lower and more efficient angles of attack. The extent of the change required is illustrated in the accompanying photograph. The blade at the left, which was originally used, is of conventional planform and is similar to designs that have been widely applied over the past several years. The other blade, which was later employed in the Flying Fortress to obtain improved high-altitude performance, is shown at the right. This second blade is typical of the designs that are appearing with increasing frequency in current installations.



Original planform of Flying Fortress blade (left) and improved form (right) currently being used in newer installations

By considering the above points, the trend of propeller changes as engine horsepower and altitude ratings increase is easily discernible. The earlier propellers were two-bladed with narrow blades, and were progressively superseded by three-bladed propellers with blades of increasing width and then by four-bladed propellers which in turn were forced to employ wider and wider blades. To go beyond this point efficiently, it was necessary to consider the use of dual-rotation propellers.

The principle of the dual-rotation propeller is not new. Its first successful use was on the Italian Macchi-Castoldi twin-float racing seaplane, which established a world's speed record of 440 mph in 1934. The multiple engines of this airplane drove coaxial counter-rotating shafts on which were mounted fixed-pitch propellers. Later, in 1938, preliminary tests were conducted at Wright Field on a pursuit plane with fixed-pitch dual-rotation propellers.

Dual Rotation Advantages

The advantage, from the standpoint of efficiency, of a dual-rotation propeller over a single-rotation propeller having the same number of blades, is due to the action of the second component of the dual-rotation propeller in straightening the slipstream. The rotation imparted to the slipstream by a single-rotation propeller represents a pure efficiency loss; a mass of air is set in motion with no useful purpose being accomplished. In the dual-rotation propeller, this same rotation is imparted to the slipstream by the leading component of the propeller, but is removed by the second component which rotates in the opposite direction, leaving the final slipstream substantially without rotation. The rotational energy lost to the air

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Reorganized SAE Engine Parts Committee Will Speed Projects

REORGANIZATION of Commitee E-5, Standard Parts, of the SAE Aircraft Engine Subdivision under the chairmanship of P. S. Farnsworth, Pratt & Whitney Aircraft, is one of many indications of the accelerating intensity of the Society's aeronautical technical work.

3 New Subcommittees

Hereafter, Committee E-5, composed of the chairman of its three new subcommittees, will serve as a steering group to coordinate these projects:

E-5A: Standard Parts. Will work on a wide range of aircraft-engine parts standardization projects. It is headed by M. E. Mills, Wright Aeronautical Corp., and is composed of D. I. Jenkins, Lycoming Division, The Aviation Corp.; Ward W. Hayes, Jacobs Aircraft Engine Co.; H. C. Beyer, Ranger Aircraft Engines; J. P. Flannery, Aircooled Motors Corp., and W. C. Oestrike, Allison Division, GMC. A number of projects of the former E-5 Committee have been taken over by this group for completion.

E-5B: Studs. Based on some preliminary studies by Mr. Farnsworth, this committee believes that a large reduction in aircraft-engine stud sizes can be effected. A survey of all studs used by all aircraft-engine manufacturers will first be made. Then the group will work on a simplification task to recommend the elimination of as many stud sizes as possible, substituting therefore more generally used dimensions. This will, according to Mr. Farnsworth, effect a great saving in manufacturing cost and will speed up maintenance work at combat airfields. J. E. Jackson, Pratt and Whitney Aircraft, is chairman of E-5B. Serving with him are W. A. Hurleman, Jacobs Aircraft Engine Co., Herman T. Dreyer, Continental Aviation & Engineering Corp., R. I. Rice, Aircooled Motors Corp., and J. G. Larger, Wright Aeronautical Corp.

E-5C: A-N Standard Parts. This committee will study the possibility of compiling and issuing a cross index of the Army-Navy standard parts against the equivalent parts, names and numbers of all manufacturers. The significant fact in connection with this task is that often a part of similar dimensions, but manufactured by another company, is available for replacement, but the service people do not appreciate that it can be used as a substitute. This cross index keyed to each A-N standard part may serve to speed up reconditioning operations as well as break bottlenecks in many assembly operations, both in the field overseas and in factories in this country. Serving under Chairman Douglas Johnson, Jacobs Aircraft Engine Co., are W. F. Burrows, Aircooled Motors Corp., M. E. Mills, Wright Aeronautical Corp., and John L. Goldthwaite, Allison Division, General Motors Corp.

Messrs. Mills, Jackson, and Johnson, chairmen of the three subcommittees, will serve with Mr. Farnsworth on Committee E-5, the controlling group of all SAE aircraft-engine standard parts projects.

Committee E-5: Standard Parts

L. to R.: P. S. Farnsworth, Pratt & Whitney Aircraft, chairman of the reorganized SAE Aircraft Engine Committee E-5, with M. E. Mills, Wright Aeronautical Corp., chairman of E-5A, Standard Parts; J. E. Jackson, Pratt & Whitney Aircraft, chairman of E-5B, Studs; and Douglas Johnson, Jacobs Aircraft Engine Co., chairman of E-5C, A-N Standard Parts. Mr. Mills is also a member of E-5C.

SAE Coming Events

Sept. 23-24
SAE National Tractor Meeting, Schroeder Hotel – Milwaukee

Sept. 30-Oct. 2
SAE National Aircraft Engineering and Production Meeting and Engineering Display, Biltmore Hotel – Los Angeles

Nov. 4-5
SAE National Fuels and Lubricants Meeting, Mayo Hotel – Tulsa

Jan. 10-14, 1944
SAE Annual Meeting and Engineering Display, Book-Cadillac Hotel – Detroit

Chicago – Nov. 8-9

Air Cargo meeting. With cooperation of National Aircraft and Aircraft Engine Activities.

Cleveland – Sept. 14

Cleveland Club; dinner 6:00 p.m. Aeronautic Meeting. Speaker to be announced.

Detroit – Sept. 27

Rackham Educational Memorial Building. The Tank Yesterday, Today and Tomorrow – Major-Gen. A. H. Gatehouse, Armoured Fighting Vehicle Branch.

Metropolitan – Sept. 9

Grand Ballroom, Hotel Pennsylvania, New York. The Development of Air Regulations and Their Effect on Future Design and Operation – Edward Warner, vice-chairman, Civil Aeronautics Board.

Northern California – Sept. 14

Leamington Hotel, Oakland; dinner 7:00 p.m. Methods of Flight Testing – J. B. Kendrick, chief aerodynamics and flight engineer, Vega Aircraft Corp.

Twin City Group – Sept. 2

Curtis Hotel, Minneapolis; dinner 6:30 p.m. Speaker to be announced.

Hardenability Testing of Steels

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Corp.; A. L. Boegehold, Research Division, General Motors Corp.; O. V. Greene and C. B. Post, Carpenter Steel Co.; and M. Asimow, W. F. Craig, and M. A. Grossmann, Carnegie-Illinois Steel Corp. By November, 1941, the subdivision had developed a Recommended Standard Method of Testing for Hardenability based on the Jominy end-quench test, which was approved as a Recommended Practice by the SAE Standards Committee in January, 1942[2] – just in time to be put to use with telling effect in the burgeoning war production program. This method is the fruit of more than two years of effort by the subdivision.

Hardenability testing accelerates the job of substituting, specifying, and applying steels because hardenability correlates so closely with many important physical properties developed by heat treatment in steels. (Hardness is generally proportional to tensile and yield strength for steels tempered after hardening). For this reason the metallurgist can be reasonably sure that a steel part will perform satisfactorily in a vehicle or machine if hardenability testing indicates that the steel meets the hardenability required for the service – *and* if the steel meets other requirements that are not necessarily dependent upon hardenability, such as machinability, tendency to warp or crack, ductility, impact and transverse properties.

To take an example, suppose it is desired to check whether a certain NE steel can be substituted for an SAE steel in a transmission gear in a military truck. The first step is to run standard Jominy end-quench hardenability tests on small, cylindrical samples of both the SAE steel and the NE steel. These tests consist essentially of first normalizing each sample, heating it to its proper quench temperature, quenching one end in a column of water, and finally determining the Rockwell C hardness at specified distances from the quenched end along the length of the specimen. Plotting these hardness values against their distance from the quenched end on a standard curve sheet results in a characteristic hardenability curve for the particular heat of the steel tested. Since hardenability for the same steel may vary from heat to heat, depending upon whether the heat is on the upper or lower side of the allowable range of chemical composition, and upon other factors such as grain size and quenching temperature, hardenability "ranges" or "spreads" giving the maximum, minimum, and the mean hardenability for a number of heats of a given steel are used in substitution and specification work whenever such data are available. (See accompanying illustrations.)

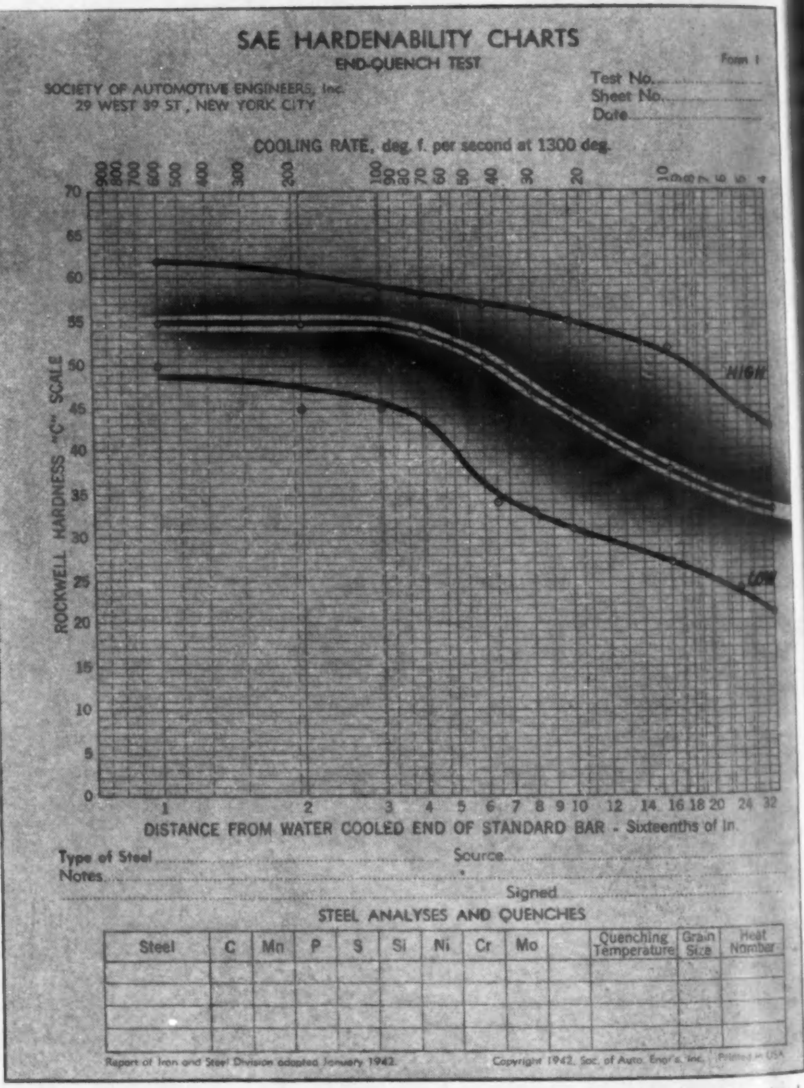
The next step is to compare the average hardenability curve or "range" of the SAE steel with the cross-section hardness of a satisfactory finished and quenched gear of the same SAE steel, and mark on the hardenability curve the points where hardness equals that of certain key points on the cross-section of the gear, such as case, core, midway, or other critical locations.

Finally, the marked SAE hardenability curve or "range" is compared with the NE curve. If the NE steel hardenability curve has hardness values that closely approximate those on the SAE hardenability curve at the key points representing critical locations on the cross-section of the gear, the NE steel can be substituted for the SAE steel from a hardenability standpoint.

War Uses by W.E.B. Group

Probably no single group of metallurgists has put hardenability testing to more effective use in our war production effort than has the Iron and Steel Committee of the SAE War Engineering Board operating under the chairmanship of W. P. Eddy, Jr., Yellow Truck and Coach Mfg. Co. This committee has used this new and powerful tool to its fullest advantage in its work of recommending substitutions to the Ordnance Department of NE steels for SAE or AISI steels, or for NE steels of higher critical material composition, in military vehicles, tanks, and guns. The committee has been combing these vehicles part by part and recommending substitutions wherever possible. In the case of some parts, of course, this committee has recommended laboratory testing before putting its o.k. on proposed substitutions. The skillful and experienced use of hardenability testing by the members of this committee is one of the secrets of the speed with which such substitutions have been made. In this way the method is contributing materially in saving thousands of tons of critical alloying elements for other war production uses and in guarding against the possibility of production shutdowns caused by shortages of the older SAE or AISI steels which were originally specified for the military vehicles or tanks. It is not surprising that this committee has met with such success in its application of hardenability testing to wartime problems, for the majority of its members are also members of the Subdivision on Hardenability Testing of the SAE Iron and Steel Division which started to develop the present standard almost four years ago.

Hardenability Range on SAE Logarithmic Form



Hardenability range representing over 80 heats of a given specification drawn on standard SAE form with logarithmic abscissa. The same data on the same steel are plotted on the ASTM arithmetical chart shown on p. 15

[2] See 1943 SAE Handbook, pp. 314-324: "Method of Determining Hardenability"; see also ASTM Standards, Part I, 1942, pp. 1106-1112: "Tentative Method of End-Quench Test for Hardenability of Steel," ASTM A-255 42T.

As the use of hardenability testing continues to spread through industry, an increasing amount of hardenability data is being developed in the laboratories of steel producers and users. The advantages of pooling and correlating these data were recognized by the metallurgists of these companies as soon as the data began to become available.

Accordingly, the SAE Iron & Steel Division, working in cooperation with the Iron & Steel Committee of the SAE War Engineering Board, in January, 1943, appealed to its membership of top metallurgists (representing both steel producers and steel users) to send in any such data available to the SAE. In succeeding months data on more than 2000 heats of some 170 specifications were collected.

SAE-AISI Committee Collecting Data

With a view to interpreting and correlating the data a joint SAE-AISI Committee on Steel Hardenability Data was appointed in June, 1943, consisting of an equal representation of users and producers from the SAE and AISI respectively.

After going over the data collected by the Iron & Steel Division, the joint committee became convinced at its first meeting that considerably more data falling within certain specified limits must be collected and correlated before the pooled results can assume the reliability and usefulness desired. Accordingly, the committee is now appealing for more data to the various steel producers and users, concentrating for the time being on a limited list of widely used SAE, AISI, and NE steels. In its appeals, the joint committee is defining the type of data that it desires to assure comparable results.

Trends in Propeller Design

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by the first component is therefore regained by the second. The lack of slipstream rotation also has secondary effects in improving the controllability of the airplane by presenting a straight air stream to the tail surfaces, and also probably decreases the drag of the fuselage and other members in the slipstream.

The use of dual-rotation propellers instead of single-rotation propellers of larger diameter also permits the use of a shorter landing gear, and the nacelles of multi-engined aircraft can be set closer to the fuselage. This leads to a substantial saving in weight in the aircraft structure, and enables the airframe to be stronger and more compact, with less structural complication.

Further advantages are to be found in the improvement in stability and maneuverability that results from the absence of any net torque reaction or gyroscopic moment due to the propellers. The application of high-horsepower engines has generally resulted in some increase in the size of aircraft. However, this increase has not been commensurate with the increase in propeller torque due to the higher horsepower. The effects of torque reaction on stability and maneuverability are, of course, most noticeable on the small, highly-powered pursuit or attack aircraft types. It can be particularly troublesome during take-off, where the airplane speed is low and the corrective effects obtainable by using the ailerons and rudder are comparatively small. With the usual right-hand rotating single-rotation propeller, the left wing will tend to dip and the greater load on the left wheel will cause the airplane to swing to the left if not corrected. In the case of twin-engined aircraft, the torque reaction of the propellers can be canceled by using one right-hand and one left-hand rotating propeller. A notable example of this use is the Lockheed P-38 Lightning. A similar correction is provided in any airplane by the use of dual-rotation propellers.

The gyroscopic moment of the propeller is also most noticeable in the small maneuverable airplane types. The effect of a right-hand propeller is such that, in pulling out of a dive, the nose of the airplane will be forced to the right, and so forth. In maneuvering during combat, the pilot finds it necessary to correct continually for this condition, and may lose the short instant of time that is available for sighting the target. This effect, as in the case of torque reaction, is canceled in dual-rotation propellers due to the opposite rotation of the two components.

First Industry-Services Aircraft Hydraulic Engineering Conference

One of the sessions of the four-day conference on aircraft hydraulic equipment held in Chicago under the auspices of the NASC and SAE at the request of the Army and Navy to discuss standardization

FIRST of a series of industry-Army-Navy conferences on aircraft hydraulic systems was a four-day meeting ending Aug. 13 at the Blackstone Hotel, Chicago.

Total attendance was 94 outstanding military and civilian aircraft hydraulic engineers invited by the SAE Hydraulic Equipment Committee and the National Aircraft Standards Committee at the request of the Army and Navy to discuss present and future design problems and correlate standardization programs covering this type of equipment. Chairman of the conference was Harry Kupiec, Glenn L. Martin Co., who is chairman of the NASC Hydraulic Systems and Installations Subcommittee, and he was assisted by H. W. Adams, chairman, SAE Committee A-6, Aircraft Hydraulic Equipment.

Nine proposed standards were approved, and six problems were presented by the Army and Navy for further study and a report to the next meeting.

William Carr, North American Aviation, Inc., reported to the conference that in his experience on the North African battlefronts the hydraulic system gave the least amount of trouble of any systems in the airplane.

Scores of assignments were made to prepare drafts and drawings for standards requested by both the Government and industry with the view of more quickly providing for interchangeability of parts. The chairman, Carl E. Stryker, Aircraft Resources Control Office of WPB, Lt.-Com. Harry Marx, and Nicholas Bashark, AAF Materiel Command, urged the confreres to indulge in the freest discussion in order to clear differences of opinion, and to achieve the various programs in the shortest possible time.

Ernest Jones, British Air Commission, assured the conference that he would report the meeting to his associates in Great Britain, and would supply the American group with details of the British aircraft hydraulic standards program.

SAE Semi-Annual Meeting

THE SAE National Aircraft Engineering & Production Meeting in Los Angeles, Sept. 30 to Oct. 2, has been designated as the 1943 Semi-Annual Meeting of the Society. A business session of the Society will be held just prior to the session on Friday evening, Oct. 1.

The Council has taken this action to fulfill the requirements of the SAE constitution that "the Society shall hold two meetings each year. The Annual and Semi-Annual Meeting . . . at such time and place as the Council may appoint."

. . . and Engineering Display

Biltmore Hotel, Los Angeles **Sept. 30-Oct. 2**

THURSDAY

MORNING Field Maintenance

Aircraft Service in Combat Areas
—George R. Sanborn, Boeing Aircraft Co.

Aircraft Engine Field Service Problems
—C. R. Paton and W. C. Gould, Allison Division, General Motors Corp.

AFTERNOON Aircraft Propellers

Flight Testing with a Propeller Thrust Meter
—George Brady, Curtiss Propeller Division

Analysis of Captured Composite Propeller Blade
—W. L. Greene and A. R. Crocker, Engineering & Research Corp.

AFTERNOON Aircraft Engines

Motion Analysis by Means of High-Speed Photography
—H. D. Jackes, Wright Aeronautical Corp.

Auxiliary Powerplants
—Blake Reynolds, Lawrance Engineering & Research Corp.

EVENING

Aircraft & Aircraft-Engine Session

Subject: Interchangeable Powerplants
Discussion Leader and Chairman, C. L. Johnson, Lockheed Aircraft Corp.

Discussion or Brief Paper
Harry Karcher, Allison Division, General Motors Corp.
Rudolph Wallace, Pratt & Whitney Aircraft
Lon Storey, Lockheed Aircraft Corp.
Ivar Shogran, Douglas Aircraft Co.
E. A. Boniface, American Airlines, Inc.

FRIDAY

MORNING Aircraft Accessories

Future Possibilities of Airplane Hydraulic System
—H. W. Adams, Douglas Aircraft Co.

Altitude Vapor Formation in Aircraft Fuel Systems
—W. H. Curtis and R. R. Curtis, Curtis Pump Co.

AFTERNOON Aircraft Production

Scheduling of Changes in Aircraft Production
—H. S. Martin, Consolidated Vultee Aircraft Corp.

Design and Development of the North American Aviation Trainer Series
—Ralph Ruud, North American Aviation, Inc.

AFTERNOON

Powerplant Installations

Carburetor Air Preheat Requirements
—W. C. Lawrence, American Airlines, Inc.

EVENING General Session

Speaker: Ranking Army Air Force Officer recently returned from battlefront, reviewing experiences with American aircraft

SATURDAY

MORNING Aircraft

Further Developments on the Application of Generalized Coordinates to Flutter Analysis
—S. J. Loring, Chance-Vought Aircraft Division, United Aircraft Corp.

Experience with Use of Magnesium in Aircraft
—J. C. Mathes, Dow Chemical Co.

AFTERNOON Open

EVENING Dinner Dance

Preventive MAINTENANCE and INSPECTION Procedure

Report of Subcommittee, Maintenance Methods Coordinating Committee, SAE Transportation and Maintenance Activity, Submitted to the Vehicle Maintenance Section, Division of Motor Transport, Office of Defense Transportation.

■

THE best preventive maintenance and inspection procedure is one designed to show *what* should be done and *when* it should be done to obtain the maximum reliable service from each vehicle at the minimum cost.

Most maintenance men agree that their objective is maximum reliability and uninterrupted service from each of their motor vehicles, but that cost is the final factor which often governs the degree to which they practice preventive maintenance. Operators, therefore, face the ever-present problem – how to keep the cost per mile, per ton, or per passenger at a minimum over the entire life of the vehicle.

In the past, motor-vehicle maintenance has been quite similar to many other industries in this country, which have relied upon the individual skill and experience of a relatively small number of people to work out their problems and maintenance procedure to fit their individual operating conditions. It may be the motor mechanic, the foreman, or the superintendent who is responsible for keeping the passenger cars, trucks, or busses rolling for his company. Too often, the owner or manager of a business considers its motor vehicles as a necessary evil, with the result that the maintenance department does not have sufficient authority to purchase the desired equipment, or the time to study the various preventive-maintenance methods and adopt the best procedure economically to maintain its vehicles. It was often a case of running the vehicle with a minimum of service and repairs until the vehicle failed on the road. This, in some cases, resulted in very short life, with the result that the vehicle

SAE Maintenance Methods Coordinating Committee

W. J. Cumming, chairman, chief, Vehicle Maintenance Section, Division of Motor Transport, Office of Defense Transportation; E. P. Gohn, test engineer, The Atlantic Refining Co.; M. E. Nuttila, superintendent, Motor Vehicles, Cities Service Oil Co.; G. W. Laurie, manager, Automotive Transportation Department, The Atlantic Refining Co.; J. Y. Ray, supervisor, Automotive Equipment, Virginia Electric & Power Co.; S. B. Shaw, automotive engineer, Pacific Gas & Electric Co.; W. A. Taussig, automotive engineer, Burlington Transportation Co.; E. W. Templin, Los Angeles Department of Water & Power; D. K. Wilson, superintendent, Automotive Equipment, N. Y. Power & Light Corp.; A. M. Wolf, automotive consultant.

Subcommittee on "Preventive Maintenance and Inspection Procedure"

E. N. Hatch, chairman, service engineer, American Brakeblok Division, American Brake Shoe & Foundry Co.; W. H. Bean, engineer, Surface Transportation Corp.; Lt. W. K. Bennett, U. S. Army, Quartermaster Motor Transport Corps; E. C. Blackman, automotive engineer, Socony-Vacuum Oil Co., Inc.; R. J. Collins, superintendent of transportation, Kansas City Power & Light Co.; B. D. Connor, superintendent of transportation, Boston Consolidated Gas Co.; A. L. Farnsworth, machine shop foreman, Kings County Buick, Inc.; Floyd Gardner, instructor of auto subjects, Los Angeles City Schools; G. N. Gascoigne, manager, Fleet Sales Department, The National Refining Co.; L. J. Heinrich, district service manager, The Autocar Sales & Service Co., Inc.; E. W. Jahn, superintendent, Transportation Department, Consolidated Gas, Electric Light, & Power Co. of Baltimore; G. W. Johnson, transportation manager, Bowman Dairy Co.; S. G. Page, general superintendent, Equitable Auto Co.; E. C. Paige, The Ethyl Corp.; W. G. Perriguey, eastern branch manager, Faber Laboratories, Inc.; J. J. Powelson, Motor Vehicle Department, Standard Oil Co. of N. J.; S. B. Shaw, automotive engineer, Pacific Gas & Electric Co.; Hoy Stevens, superintendent of maintenance, The Cleveland, Columbus, & Cincinnati Highway, Inc.; O. W. Teckemeyer, inspection specialist, U. S. Treasury Dept., Procurement Division; M. E. Nuttila, project chairman.

would be scrapped and a new one purchased. Today, this practice cannot be permitted. New cars, trucks, or busses are not to be purchased just because it is cheaper than to repair the old vehicle. The question of cost of a new vehicle versus the maintenance of the old vehicle is *out* for the duration, and in all probability for many months after the war ends.

When there were plenty of mechanics who had grown up with a particular system, much of the system was carried in the heads of the workmen and supervisors, because it had been developed gradually and much of the instruction was never written down. Now, with a mechanic shortage, men must be trained in the specific procedure of repairing or inspecting a given unit or part.

Unfortunately, there are not enough properly trained maintenance men in this country to do the job without a combined effort of training. To simplify this training, there is a real need for a standard basic plan which is as simple as possible and still fits the demands of all fleet operations, large and small. It must be a plan that can be used by the individual with one or two vehicles, or the largest fleets with hundreds of cars, trucks, and busses. It must consider the motor vehicles used in the hot, sandy desert or in the frozen North.

Best use should be made of manpower, trained or untrained. New parts needed to repair vehicles may be hard to obtain, if not impossible, thereby requiring extensive salvaging and substitutes for many materials which have been available in the past.

It is surely obvious that replacement of parts cannot be specified on any mileage basis without inspection and determination of actual or incipient failure. In an inflexible system, tailored to one operation, replacement of any part can be specified on the basis of mileage because it may have been found by experience in that operation to be the proper period for replacement, but even this is doubtful. There is plenty of evidence that many parts have been replaced at mileage intervals based on obsolete experience, or on nothing more than a good round mileage figure that appealed to the man in charge. If this logic fails to impress, it might be noted that ODT instructions do not permit the replacement of parts unless there is some evidence that the part will no longer serve its purpose, and "average" life is not allowed as evidence.

Many large fleets of busses and trucks have, for some years, been practicing preventive maintenance. There are much data available on individual fleet maintenance, as it applies to a certain type of vehicle operating under certain definite conditions. It is not an easy problem to collect all these data, separate the good from the bad, and arrive at the best basic plan upon which to build a flexible procedure. On the other hand, there has never been a time when one was needed more than today.

This committee has been working on this problem for several months, with many of the leading maintenance men of this country generously contributing their experience and time.

■ What Should Be Done

What units, parts, or items require maintenance? The answer obviously is that every part of the vehicle requires attention at some time during the normal life of the vehicle. The general term "inspection," or "check," has been used in most maintenance instructions. If a trained personnel is available who knows what is to be done when a vehicle or unit is to be inspected, the operator is indeed fortunate. However, in designing a basic preventive maintenance and inspection procedure, it is not possible to presume too much, but the objective is to be as specific as possible without losing the necessary flexibility. In place of the common term "inspect," or "check," the following common functions are proposed:

A – Adjustments.
T – Tests.
O – Oil, lubricate or grease.
L – Light or visual check-up.
H – Heavy or physical inspections and repair.
R – Replacements, rebuild, or recondition.

One or more of these common functions of maintenance can be applied to every part of the vehicle. In order to simplify the preventive maintenance and inspection procedure to a workable basis, it seems necessary to have an index in chart form for instant reference. It is not an easy job to make up an index that can be used for all types of vehicles and not have it too bulky for practical use. Dividing the vehicles into groups, systems, units, parts, and functions, and assigning a number and letter to each item in an alphabetical system, gives the desired flexibility, whereby new units, parts, or items can be added as new designs are made available to the operator.

There are 15 groups:

1 – Axle, front.
2 – Axle, rear.
3 – Body and cab.
4 – Brake system.
5 – Clutch.
6 – Cooling system.
7 – Electrical system.
8 – Engine.
9 – Frame springs and mounting.
10 – Fuel and exhaust system.
11 – Special equipment.
12 – Steering system.
13 – Transmission.
14 – Propeller shaft (or drive line).
15 – Wheels, rims, and tires.

These groups were selected as being the most generally used, and having logical arrangement by systems. The question of where one group of parts should end and the other group start, has been a debatable subject, but should a mechanic be asked to remove the complete fuel system from a vehicle, there would be little question in his mind until he reached the engine manifold. Since the manifolds, intake and exhaust, are in most cases designed for one type of engine only, it is logical to class them as engine parts along with the valves. Therefore, the logical point of separation between the fuel system and the engine would be at the manifold flange.

Under each group, the item to be considered for preventive maintenance and inspection procedure has been listed alphabetically and given a letter and number. This provides the desired flexibility, whereby new items can be added to their proper group under the proper alphabetical letter by adding the next number.

This basic index, although relatively short, covers practically every item that has been used on all the maintenance systems that are available.

By the use of this basic index and the common func-

tions, such as adjustments, it has been possible to tabulate *what* has been done, and *when* it was most generally considered necessary.

When Should Certain Functions Be Done

There is one most common measure of *when,* and that is on the mileage basis. There are some fleets that use the number of gallons of fuel used in each engine to determine when it should be called in for a maintenance service. Others work on a time basis. There is one thing that all agree on – that the design of the vehicle, the operating conditions, loads, speeds, weather conditions, and lubricants used, all have a bearing on *when* a maintenance service should be made. With all these variables, it is not practical or economical to set a definite mileage standard between service periods which will fit all types of cars, trucks, and buses. The *average mileage* interval between maintenance service used by most fleets in this country fits into the general classification shown in Table 1.

Table 1 – Maintenance Service

Type of Vehicle	"A"	"B" Miles	"C" Miles	"D" Miles	"E" Miles
Passenger cars	Daily	1000 to 2000	4000 to 6000	30,000 to 50,000	60,000 to 100,000
Light trucks, stop-and-start service	Daily	500 to 2000	3000 to 5000	20,000 to 30,000	40,000 to 60,000
Light trucks, long-haul service	Daily	1000 to 2000	4000 to 6000	40,000 to 60,000	80,000 to 120,000
Heavy trucks, stop-and-start service	Daily	500 to 2000	3000 to 5000	30,000 to 40,000	60,000 to 80,000
Heavy trucks, long-haul service	Daily	1000 to 2000	4000 to 6000	40,000 to 60,000	80,000 to 120,000
Small buses, city service	Daily	1000 to 2000	3000 to 5000	30,000 to 40,000	60,000 to 80,000
Small buses, cross country	Daily	1000 to 2000	4000 to 8000	40,000 to 60,000	80,000 to 120,000
Large buses, city service	Daily	1000 to 2000	4000 to 6000	40,000 to 60,000	80,000 to 120,000
Large buses, cross country	Daily	1000 to 2000	4000 to 6000	40,000 to 60,000	80,000 to 120,000

By standardizing the type of maintenance service, keeping in mind that it is essential to have a minimum number of types and at the same time cover the requirements over the complete life of the vehicle, the basis for a preventive maintenance and inspection procedure is simple. It has the flexibility of readily changing the mileage interval to fit changing conditions either in vehicle design or operating conditions.

"A" Maintenance Service – The "A" maintenance service is designed to cover the items and work normally required every day, or each time the vehicle is garaged. It includes the servicing operation, such as gas, oil, water; light inspection, such as looking for oil and water leaks; and testing of some items. This "A," or daily maintenance service, is very important to the success of any preventive maintenance system.

"B" Maintenance Service – The "B" maintenance service is primarily designed to fit the lubrication period. There are a number of adjustments and tests which fit in "B" maintenance service, in addition to the "A" service, or light visual check-up. The kind of lubrication used, design of the equipment, and the operating conditions, all affect the mileage interval in "A" maintenance service. With the present-day demand to keep vehicles in the best possible condition to prevent unnecessary wear, it seems desirable to keep the mileage between lubrications at a minimum. The manufacturer of the vehicle has in most cases specified the type of lubrication best suited to the design of the vehicle.

"C" Maintenance Service – The "C" maintenance service includes, in addition to the function of "B," most of the adjustments and tests, plus a heavy or physical inspection with repairs. It may involve replacement in order to obtain the necessary adjustment or test results. It should be kept in mind that the success of any preventive maintenance and inspection procedure depends not merely on finding the defect, but on the correction, adjustment, or replacement in time to save man-hours and material.

The time involved on this "C" maintenance service depends upon the vehicle design, the shop equipment, special tools, and the working conditions. It is practically impossible to make a satisfactory inspection of many parts until they have been properly cleaned. Adequate chassis-cleaning equipment is very important.

"D" Maintenance Service – The "D" maintenance service is designed to fit the more extensive repairs, such as replacement of piston rings, engine-bearing adjustment, heavy-unit replacement, in which more time and equipment are required than on the "C" service. The mileage interval between "D" maintenance service periods will vary considerably, and it is recommended that the vehicle be assigned to "D" service as the result of tests made on "C" service, which indicate that the vehicle's valves, rings, or bearings are worn to the point that the vehicle has lost power or operating efficiency.

"E" Maintenance Service – The "E" maintenance service is the period at which the engine is removed, completely disassembled, and rebuilt. There are many other units and parts of the vehicle that require only infrequent rebuilding which can be economically done during this overhaul period. Rather extensive body work and paint jobs fit in this type of overhaul, with a maximum saving of manpower and minimum out-of-operating time for the vehicle. A preventive maintenance and inspection procedure would not be complete without making provisions for this complete service, designed primarily to cover the infrequent but expensive time-consuming jobs. The time of mileage in the "E" maintenance service will vary more than any of the other maintenance services. The design of the vehicle, the operating condition, and the quality of the "A," "B," and "C" maintenance services are the most important factors, affecting the vehicle condition and amount of work that will be required on the "E" maintenance service.

Table 2 – Preventive Maintenance and Inspection Procedure

CODE: A – Adjustments; T – Tests; O – Oil, lubricate, or grease; L – Light or visual check-up; H – Heavy or physical inspections and repair; R – Replacements, rebuild, or recondition

Group No. 1 – Axle, Front

	Item	Maintenance Service "A"	"B"	"C"	"D"	"E"
1-A1	Axle center	..	L	H	H	R
1-A2	Axle and wheel alignment	..	L	TA	TA	TA
1-B1	Brake spider	..	L	H	H	R
1-S1	Steering knuckle and pins	..	OL	OHT	OH	R
1-S2	Steering arms	..	L	H	H	R
1-T1	Tie-rod assembly	..	AOL	AOH	AOH	R
1-T2	Thrust bearings	..	OL	OH	OH	R

Group No. 2 – Axle, Rear

	Item	"A"	"B"	"C"	"D"	"E"
2-A1	Axle shaft	L	L	H	R	R
2-D1	Differential housing	..	OL	OH	OH	R
2-D2	Differential gears	..	L	L	H	R
2-D3	Differential bearings	..	..	L	AH	R
2-H1	Housing tube and spider assembly	..	L	L	H	R
2-P1	Pinion shaft and worm oil seals	..	L	L	AH	R
2-R1	Radius rods	..	L	H	H	R
2-W1	Wheel bearings oil seal	..	L	L	H	R

Group No. 3 – Body and Cab

	Item	"A"	"B"	"C"	"D"	"E"
3-B1	Bumpers	..	L	H	H	H
3-C1	Cross members	..	L	H	H	H
3-C2	Curtains	..	L	H	H	H
3-D1	Doors	T	OLT	OAH	OAH	R
3-D2	Door engine (air) and mounting	..	OLT	OAH	OAH	R
3-D3	Door controls	T	OLT	OAH	OAH	R
3-E1	Engine housing, hood, and splash pan	..	L	H	H	R
3-F1	Frame body (or chassis)	..	L	H	H	H
3-F2	Fenders	L	L	H	H	H
3-F3	Flooring	L	L	H	H	H
3-F4	Fire extinguisher	..	L	TH	TH	TH
3-F5	Fifth wheel (tractor and semi-trailers)	..	OL	OH	OH	R
3-I1	Instrument panel (speedometer, etc.)	..	L	H	H	H
3-L1	Landing gear (semitrailers)	..	OL	OH	OH	R
3-L2	License plates and mountings	L	L	H	H	H
3-M1	Mirrors	L	L	H	H	H
3-P1	Exterior side panels	..	L	H	H	H
3-P2	Exterior roof panels	..	L	H	H	H
3-P3	Interior panels	..	L	H	H	H
3-P4	Paint	L	L	H	H	R
3-R1	Running boards	L	L	H	H	H
3-S1	Destination signs	L	L	H	H	R
3-S2	Seats	L	L	H	H	R
3-S3	Stanchion and grab rail	..	L	H	H	R
3-S4	Steps	..	L	H	H	R
3-S5	Sun visors	..	L	H	H	H
3-V1	Ventilators	..	TL	TH	TH	R
3-W1	Windows, glass	..	L	H	H	H
3-W2	Windshield wiper motor and blades	L	TOL	TOH	TOH	R

Group No. 4 – Brake System

	Item	"A"	"B"	"C"	"D"	"E"
4-B1	Brake blocks or lining	..	TL	THA	THA	THA

Group No. 4 – Brake System (continued)

	Item	Maintenance Service "A"	"B"	"C"	"D"	"E"
4-B2	Brake shoes, springs, rollers, and pins	..	LO	OH	R	R
4-B3	Brake valve	T	TL	TH	R	R
4-B4	Brake controls, pedal and linkage	..	OL	OH	OH	R
4-B5	Brake chambers, mountings, and parts	..	TL	TH	TH	R
4-C1	Cams, brake	..	ALO	AOH	R	R
4-C2	Compressor (air), drive and mounting	OL	OLT	AOTH	AOTH	R
4-C3	Cylinders and hydraulic lines	..	L	H	H	R
4-D1	Drums, brake	..	L	H	H	H
4-G1	Governor	..	TL	TH	AH	R
4-H1	Flexible brake chamber hose	..	TL	TH	TH	R
4-H2	Hand brake controls	T	OTL	OTH	OTH	R
4-I1	Interlock cylinder	..	OTL	OTH	OTH	R
4-L1	Lines and fittings, air and water	..	L	HT	HT	HT
4-M1	Magnetic air valve	..	L	TH	TH	R
4-M2	Master cylinder (hydraulic)	..	OL	OL	OH	R
4-Q1	Quick release valve	..	TL	TH	TH	R
4-P1	Pressure regulating valve	..	TL	TH	TH	R
4-R1	Relay valve	..	L	TH	TH	R
4-S1	Slack adjusters	..	OA	OAL	OAH	R
4-S2	Safety valve	..	L	H	H	R
4-T1	Tanks, air valves and gages	Drain	L	TH	TH	R
4-T2	Trailer-brakes	..	TL	TH	TH	R
4-V1	Vacuum booster cylinder	..	L	OH	OH	R

Group No. 5 – Clutch

	Item	"A"	"B"	"C"	"D"	"E"
5-A1	Adjusting ring	..	T	A	H	R
5-B1	Bearing	..	O	OL	OH	R
5-C1	Clutch assembly	T	LAO	HAO	R	R
5-C2	Clutch control	T	TLOA	THAO	THAO	R
5-C3	Clutch disc and facings	..	T	T	R	R
5-C4	Clutch pressure ring	..	..	..	H	R

Group No. 6 – Cooling System

	Item	"A"	"B"	"C"	"D"	"E"
6-F1	Fan belts and adjusting screws	L	AH	AH	AH	R
6-F2	Fan, mounting parts and drive	..	LO	HO	HO	R
6-H1	Heater, water and controls	..	OTL	OTH	OTH	R
6-H2	Hose, radiator	..	L	H	R	R
6-P1	Pump couplings, water	..	L	H	R	R
6-P2	Pumps, water	..	OLA	OHA	R	R
6-R1	Radiator	(Fill)	L	H	H	R
6-R2	Radiator mounting parts	..	L	H	H	H
6-R3	Radiator shutter and controls	L	OTH	OTH	OTH	R
6-T1	Temperature indicators	..	L	H	AH	R
6-T2	Thermostats	..	L	H	AH	R
6-W1	Water lines	..	L	H	H	H

Group No. 7 – Electrical System

	Item	"A"	"B"	"C"	"D"	"E"
7-A1	Apparatus box or regulator	..	TL	TAH	TAH	R
7-A2	Ammeter (generator charge)	T	TL	TH	TH	TH
7-B1	Battery, cables and mounting	..	TL	TH	TH	TH
7-B2	Buzzer and cord	T	TL	TH	TH	TH

In Table 2, the unit and parts common to most vehicles have been itemized, and under each of the five maintenance services, namely, "A," "B," "C," "D," and "E," it has been indicated what should be done.

To recommend a preventive maintenance and inspection system which did not provide for changing conditions would be useless under the present labor and material conditions in this country. The idea that a preventive maintenance system is based on a cut-and-dried mileage basis is obviously incorrect. Mileage limits, maximum and minimum, have been indicated. These are based upon the experience of many fleet maintenance men, within which certain tests, adjustments, and other common maintenance functions should be done under the average conditions.

■ Check Sheets

Check sheets, paper tools, have a desirable place in applying the maintenance procedure to the vehicle. It has often been the form of the check sheet which has prompted such statements as: "Your maintenance procedure does not fit my condition." A check sheet, designed for use in a diesel-electric bus fleet, would not have exactly the same items to be checked as would a check sheet used by a passenger-car operation.

Table 2 – Preventive Maintenance and Inspection Procedure

(Continued)

Group No. 7 – Electrical System (continued)

	Item	Maintenance Service "A"	"B"	"C"	"D"	"E"
7-C1	Coil	..	L	HT	HT	R
7-C2	Condenser	..	L	HT	HT	R
7-C3	Control equipment (electric drive)	T	TL	TAH	TAH	R
7-D1	Distributor	..	OTL	OATH	R	R
7-F1	Fuses	..	TL	TL	TH	TH
7-G1	Generator, drive and mounting (low voltage)	T	OTL	OAH	R	R
7-G2	Generator (electric drive)	..	OL	OHT	OHT	R
7-H1	Heater and ventilator motors	..	TLO	THO	THO	R
7-H2	Headlamps	T	TL	AH	AH	AH
7-H3	High-tension ignition wire	..	L	H	H	R
7-H4	Horn, wire and button	T	TL	TH	TH	R
7-L1	Lights	T	TL	TH	TH	TH
7-M1	Magneto	..	TL	TAH	R	R
7-M2	Motor (electric drive)	..	OL	OHT	OHT	R
7-S1	Spark plugs	..	TL	AH	R	R
7-S2	Starting motor and cables	T	OTL	OTH	R	R
7-S3	Switches	T	TL	TH	TH	TH
7-S4	Stop-light switch	T	T	TL	TH	R
7-T1	Turn signals (directional)	T	TL	TH	TH	R
7-W1	Wiring	..	L	H	H	H
7-W2	Windshield wiper (electric)	..	TOL	TOH	TOH	R

Group No. 8 – Engine

	Item	"A"	"B"	"C"	"D"	"E"
8-A1	Accessory shaft and pulley	..	..	AL	AH	R
8-B1	Bell housing	..	L	H	H	R
8-C1	Camshaft	..	L	AH	AH	R
8-C2	Connecting rods	..	L	L	AH	R
8-C3	Crankcase and main bearings	L	L	L	AH	R
8-C4	Crankshaft	..	..	..	H	R
8-C5	Cylinder block	L	L	H	H	R
8-C6	Cylinder head	L	L	HT	RT	R
8-E1	Engine cranking parts	..	TLO	THO	THO	R
8-E2	Engine to compressor drive	..	L	H	H	R
8-E3	Engine mounting parts	..	L	H	H	R
8-F1	Flywheel, ring gear	..	L	L	H	R
8-G1	Gear cover and adjusting screws	..	L	AH	AH	R
8-M1	Manifold and heat control	..	L	H	H	R
8-O1	Oil filter and element	L	L	H	R	R
8-O2	Oiling system and gage	LT	LT	HT	HT	R
8-O3	Oil pan	LO	LO	HO	RO	R
8-P1	Piston rings and pins	..	L	LT	R	R
8-T1	Timing gears	..	L	AL	AH	R
8-V1	Valve and lifter parts	..	L	AHT	RA	R

Group No. 9 – Frame Springs and Mounting

	Item	"A"	"B"	"C"	"D"	"E"
9-H1	Hanger Brackets	..	L	H	H	H
9-S1	Shackle bars	..	L	H	H	R
9-S2	Shackles and pins	..	OL	OH	OH	R
9-S3	Spring "U" bolts	..	L	H	H	H
9-S4	Springs and center bolts	..	L	H	H	R
9-S5	Shock absorbers	..	L	H	H	R
9-T1	Torque rods	..	OL	OHA	OHA	R

Group No. 10 – Fuel and Exhaust System

	Item	"A"	"B"	"C"	"D"	"E"
10-A1	Air cleaner	..	HO	HO	HO	R
10-B1	Blower	..	LO	HO	R	R
10-C1	Crankcase air breather and connections	..	L	H	H	R
10-C2	Carburetor	....	AL	AH	R	R
10-C3	Carburetor controls	T	OL	OH	OH	R
10-C4	Choke	T	TL	TH	AH	R
10-E1	Exhaust and tail pipe	..	L	H	H	H
10-F1	Fuel pump (gasoline)	..	TL	TH	R	R
10-F2	Fuel pump (diesel)	..	L	H	H	R
10-G1	Governor	..	AL	AH	R	R
10-G2	Gas tank and fuel lines	(Fill)	L	H	H	H
10-G3	Gage, fuel	L	L	L	H	H
10-I1	Injectors	..	TL	TH	R	R
10-M1	Mufflers and hanger brackets	..	L	H	H	H
10-S1	Strainers (all fuel) and filters	..	L	H	H	R
10-V1	Vacuum tank	..	TL	TH	TH	R

Group No. 11 – Special Equipment

	Item	"A"	"B"	"C"	"D"	"E"
11-F1	Flares	..	L	H	H	H
11-R1	Reflectors	L	L	H	H	H

Group No. 12 – Steering System

	Item	"A"	"B"	"C"	"D"	"E"
12-D1	Drag links	..	OL	OAH	R	R
12-S1	Steering arm	..	L	H	H	R
12-S2	Steering wheel	..	L	H	H	H
12-S3	Steering gear assembly	....	OTL	OTH	OTH	R

Group No. 13 – Transmission

	Item	"A"	"B"	"C"	"D"	"E"
13-C1	Cooler (hydraulic)	..	L	H	H	R
13-C2	Countershaft assembly	..	L	H	AH	R
13-G1	Gears (transmission)	..	L	L	H	R
13-P1	Power take-off equipment	..	OL	OH	OH	R
13-T1	Transmission cover and assembly	..	OL	OH	OH	R
13-T2	Transmission case and bushing assembly	..	OL	OH	OH	R
13-T3	Transmission control	..	OTL	TOH	TOH	R
13-T4	Transmission cross shaft	..	OL	OH	OH	R
13-T5	Turbine (hydraulic)	..	OL	OH	OH	R

Group No. 14 – Propellor Shaft

	Item	"A"	"B"	"C"	"D"	"E"
14-D1	Drive shaft	..	OL	OH	OH	R
14-H1	Hanger bearing and mounting	..	OL	OH	OH	R
14-U1	Universal joints	..	OL	OH	OH	R

Group No. 15 – Wheels, Rims, and Tires

	Item	"A"	"B"	"C"	"D"	"E"
15-B1	Bearings	..		OTL	OAH	R
15-H1	Hub cap	..	L	H	R	R
15-H2	Hubodometer		L	H	H	R
15-R1	Rims, studs, and nuts	L	H	H	H	R
15-S1	Spider		L	H	H	R
15-T1	Tires	L	TL	TH	TH	TH

Conclusions

The present war condition, resulting in more severe operating conditions, shortage of trained mechanics and repair parts for motor vehicles, has caused the vehicle owner, as well as the maintenance men, to give serious consideration to what must be done to keep his vehicles in a satisfactory operating condition for the duration of the war, or until new equipment will be available.

The practical application of a preventive maintenance and inspection procedure requires a simple, concise, yet flexible, system that will extend the life of the vehicle and save replacement parts and labor.

To simplify the recommended preventive maintenance and inspection procedure, all important parts of the motor vehicle (car, truck, or bus) have been divided into groups and systems, and arranged alphabetically to provide a quick, practical source of reference.

Using a standard type of service, the mileage or time interval can be varied to fit the individual operating conditions and still maintain a standard maintenance service. The number of mechanical failures on the road is the best indication as to how often the vehicle should be serviced.

Too few inspections – Many failures = Excessive cost.
Too many inspections – No failures = Excessive cost.

James F. Shannon
New England

Wallace Linville
So. California

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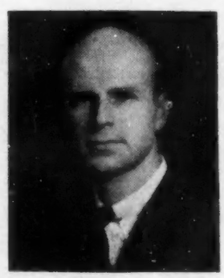

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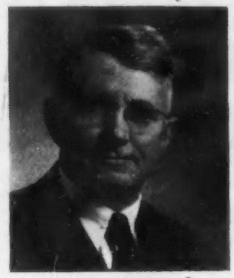

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About SAE Members...

SYDNEY G. TILDEN, president and treasurer of S. G. Tilden, Inc., Brooklyn, N. Y., and former chairman of the Metropolitan Section and active for many years in national technical and administrative committees of the Society, has been appointed a lieutenant commander in the Navy by Secretary Knox. He has been assigned to the Boston Inspection District, Office of Procurement & Material, Navy Department, Park Square Building, Boston, Mass. He has been a member of the SAE for more than 20 years. During the past two years he has been manufacturing aeronautical equipment of his design for the Navy.

FRED M. YOUNG has been appointed vice-president and member of the board of directors of Western Metals Specialty Mfg. Co., Milwaukee.

WILLIAM B. HURLEY, for some months past on leave of absence from The Detroit Edison Co., has resigned from the Detroit Ordnance District and has taken up his former duties with The Detroit Edison Co. Mr. Hurley was appointed assistant chief of the Detroit Ordnance District in March, 1940, and began full-time duty with Detroit Ordnance in January, 1942. Mr. Hurley filled the following positions: chief of the Ammunition Branch, chief of the Tank Branch, and assistant to the chief of the Industrial Division in charge of production. Mr. Hurley is staff engineer in the sales department of The Detroit Edison Co.

Election of **PHILIP G. BLENKUSH,** instructor of aeronautics and assistant laboratory supervisor at the University of Detroit, to the presidency of the Junior Division of the Engineering Society of Detroit was announced recently. Mr. Blenkush received his bachelor of aeronautical engineering degree from University of Detroit's College of Engineering in 1941 and is faculty adviser for the SAE Student Branch at the College.

WALTER E. BENJAMIN has been advanced to the newly-created position of assistant works manager, the Pierce Governor Co., Anderson, Ind. Mr. Benjamin was formerly sales engineer and experimental engineer.

Charles S. Davis (left), president of the Borg-Warner Corp., confers with Robert P. McCulloch, head and founder of the McCulloch Engineering Corp., Milwaukee, which has been acquired by the Borg-Warner Corp. Mr. McCulloch remains as president and director of the company, and will have active charge of the plant's operations

L. I. Woolson

L. I. WOOLSON recently became factory manager of the DeSoto Plant of the Chrysler Corp., Detroit. He was formerly chief engineer.

GEORGE P. TEXADA is a major in the U. S. Army Air Forces. He is stationed in Atlanta, Ga., as fuel and zone officer.

JACK E. DAVIS is employed by the Army Air Forces, Mid-Central Procurement District, as a mechanical engineer in charge of technical control work for the Army at the Dodge Chicago plant. He is also an evening instructor at the Illinois Institute of Technology, teaching aircraft-engine power measurements. Mr. Davis was formerly junior mechanical engineer for the Army Air Forces at the Buick Aviation Engine Plant, Melrose Park, Ill.

C. W. MUSSER has left the Jubilee Mfg. Co. of Omaha, Neb., to assume the position of chief engineer of the Relay Division, Allied Control Co., Inc., Chicago.

The National Advisory Committee for Aeronautics announced that **DR. GEORGE W. LEWIS,** its director of aeronautical research, attended a series of conferences with West Coast aircraft manufacturers. At a recent NACA meeting in Washington, it was agreed that Dr. Lewis should make an immediate survey of the present status of aeronautical research and development and of the steps necessary to accelerate the solution of design problems involved in the new types of aircraft under development.

Formerly an engineer for Thompson Products, Inc., Detroit, **PHILIP H. SMITH** is now with the Industrial Products Division of Firestone Tire and Rubber Co., Detroit.

PETER de PAOLO, pioneer auto-racing driver and winner of the 1925 Indianapolis 500-mile race, is now a major in the U. S. Army Air Forces. Major de Paolo had been field engineer for the Hastings Mfg. Co., Hastings, Mich.

STEPHEN FERENCE recently resigned from his position as director of service, Chrysler Pittsburgh, Inc., Pittsburgh, Pa., and is now employed by the Curtiss-Wright Corp., Caldwell, N. J., as field service representative in the Propeller Division.

Formerly production engineer, Muskegon Piston Ring Co., **HENRY APPELT** is now process engineer in the Norge Division of the Borg-Warner Corp., Muskegon Heights, Mich.

Formerly assistant sales manager, the Steel Co. of Canada, Ltd., Hamilton, Ont., **D. B. McCOY** has been promoted to general sales manager.

Ralph S. Damon

J. B. Macauley, Jr.

The resignation of **RALPH S. DAMON** as president of Republic Aviation Corp. was announced recently by the chairman of the board of directors of the company. Mr. Damon, who assumed presidency of the corporation in May, 1941, will continue to serve as a member of the board of directors, subject to the approval of the Civil Aeronautics Board. Mr. Damon was granted leave of absence from American Airlines to become president of Republic in order to assist the latter company in attaining quantity production of the Republic P-47 Thunderbolt. Mr. Damon returns to American Airlines as its vice-president and general manager. **ALFRED MARCHEV** succeeds Mr. Damon as president of Republic. Mr. Marchev joined Republic in 1942 as assistant to the president, later becoming vice-president and general manager. Early this year he was elected to the board of directors and on June 1 was appointed executive vice-president in charge of all operations of the company.

ROBERT EDLEFSEN, who had been an engineer for Joslyn & Ryan, San Francisco, is in the 369th Engineers Regiment, H. & S. Company, A. P. O. 181, c/o Postmaster, Los Angeles.

TRACY LANGDON has resigned from the D. A. Stuart Oil Co., Chicago, after 23 years of service, the last 14 in the capacity of vice-president, to become an executive of the American Oil & Supply Co. of Newark, N. J.

A. B. SAXMAN is now with the Socony-Vacuum Oil Co., New York City. Mr. Saxman was formerly a project engineer for the B G Corp., also New York.

Formerly Washington representative for the New England High Carbon Wire Co., **GEORGE W. NICOLETTI** is now field engineer, with headquarters at Detroit. Mr. Nicoletti was transferred to the Detroit area after spending 14 months in Washington for the company.

LEROY V. CRAM has been transferred from product engineer, Allison Division, General Motors Corp., Indianapolis, to the Detroit Diesel Engine Division of General Motors in Detroit.

J. B. MACAULEY, JR., has joined the Engineering Department of Pratt & Whitney Aircraft, Division of United Aircraft Corp., East Hartford, Conn. Mr. Macauley was formerly research engineer at the Chrysler Corp. in Detroit.

ENSIGN EDWARD S. BENTLEY'S address has changed from N.P.O. 231 to N.P.O. 1925, c/o Postmaster, N. Y.

ENSIGN DONALD CONRARD, USNR is in the Assembly and Repair Department, U. S. Naval Air Station, Alameda, Calif. Ensign Conrard had been a carburetor test inspector at the Wright Aeronautical Corp., Lockland, Ohio.

ROLAND ST. AUBIN, air line maintenance mechanic, American Airlines, Inc., Buffalo, N. Y., has been sent on a foreign assignment to Scotland. His address is Det. A. T. C., A. P. O. 648, c/o Postmaster, New York.

Richard C. Aland

After a short leave of absence **RICHARD C. ALAND** has returned to Continental Motors Corp. to assume his duties as engineer in charge of design in the newly-created New Engines Department. Mr. Aland has been with Continental for the past several years as designer and project engineer on aircraft engines.

ARTHUR P. FRAAS, test engineer in the Aircraft Engine Division of the Packard Motor Car Co., Detroit, is the author of a new book entitled "Aircraft Power Plants," which has been designed primarily to give the undergraduate and graduate engineer a knowledge of the fundamentals of aircraft-engine testing, installation, operation, and maintenance. It contains also a short section on propeller theory, performance, construction, and installation. The treatment of the subject is as simple as it permits; however, a familiarity with college physics, thermodynamics, and fluid mechanics is assumed. Wherever possible, test results have been included to substantiate important points. The book is also made more useful by a list of references at the end of each chapter. The volume has 472 pages including 253 charts and photographs. It is published by the McGraw-Hill Book Co. Mr. Fraas was, until recently, an instructor in aircraft engines, Daniel Guggenheim School of Aeronautics, New York University.

NOEL J. LITUCHY, formerly an ignition engineer in the Engine Department, Allison Division, General Motors Corp., Indianapolis, is now with the Collins Radio Co., Cedar Rapids, Iowa, as mechanical development engineer.

Formerly chief engineer for Yates Aircraft Corp., Beaverton, Ore., **BRITT M. SMITH** is now with the Goodyear Aircraft Corp., Akron, as senior development engineer.

JOHN WALKER, who had been in the Allentown, Pa., office of the Mack Mfg. Corp., is now in the company's New York office. Mr. Walker retains his position as assistant to the chief engineer.

Formerly designer for Associated Designers, Birmingham, Mich., **FRANCIS GALDO** is now with the Hercules Engineering Co., Detroit, as tool designer.

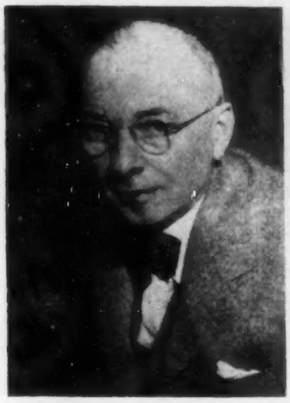
ROBERT C. HAMILTON is in the U. S. Army Air Forces Officer Candidate School at Miami Beach, Fla. He was formerly junior mechanical engineer and test engineer, Wright Engine Project Office, Power Plant Laboratory, U. S. Army Air Forces, Headquarters Squadron, Materiel Command, Wright Field, Dayton, Ohio.

Paul R. Jordan

PAUL R. JORDAN, formerly technical service director, was named general manager of the Harvill Corp.

OLIVER H. COTÉ, JR., USNR, has been promoted from lieutenant to lieutenant commander. He is now head of the Structural Modifications Section, Engineering Division,

SAE Vice-President Survives Crash in Which Two Other SAE Members Die



W. K. Cooper

S. K. Hoffman

Harold Caminez

SAE Vice-President S. K. Hoffman escaped death in a transport plane crash on July 28 in which SAE members Harold Caminez and W. K. Cooper were killed. Twenty passengers were killed and two saved in the accident, which occurred near Trammel, Ky. Within a few seconds after striking the ground the plane burned – just after Mr. Hoffman and one other passenger had succeeded in escaping through a shattered window.

Having sustained serious burns and a broken ankle, Mr. Hoffman was removed immediately to a hospital, where this photograph was taken the following day. Like Mr. Hoffman, Mr. Caminez and Mr. Cooper were connected with the Lycoming Division, The Aviation Corp., Mr. Caminez as chief engineer of the Air-Cooled Engine Division and Mr. Cooper as vice-president in charge of sales. Currently the leader of SAE's Aircraft-Engine Activity, Mr. Hoffman is chief engineer of Lycoming. He is still in City Hospital, Bowling Green, Ky., recovering from his injuries

Bureau of Aeronautics, Navy Department, Washington.

WILLIAM B. GRIESE, formerly plant manager of the Liquid Cooled Engine Division, Toledo, has been transferred to plant manager of the Spencer Heater Division of The Aviation Corp., at Williamsport, Pa. For 17 years before becoming associated with The Aviation Corp., Mr. Griese was with the Crosley Corp. in Cincinnati.

The National Advisory Committee for Aeronautics at a recent meeting confirmed the appointment of **GROVER LOENING,** consultant on aircraft of the War Production Board, as chairman of its Subcommittee on Helicopters, which is organized under the NACA Committee on Aerodynamics. Mr. Loening is the author of "Monoplane and Biplanes," "Military Aeroplanes," and "Our Wings Grow Faster," as well as many magazine articles. He is the inventor of the strut-braced monoplane and the Loening Amphibian, and holds many patents.

JOHN G. CRAWFORD, formerly automotive instructor, U. S. Army Ordnance Motor Transport School, Stockton, Calif., has been transferred to Camp San Anita, Arcadia, Calif. He is an instructor in the Automotive Division.

MALCOLM C. MORRISON, who had been automotive engineer, U. S. Army Tank-Automotive Center, Motor Transport Service, Engineering Division, Detroit, is now in the Ordnance Department of the Tank-Automotive Center as chief of the Truck Group.

EUGENE ROTH has been promoted from captain to major. Major Roth is in the Ordnance Department of the U. S. Army, and can be reached through A.P.O. 499, c/o Postmaster, New York.

Formerly an engineer with the Republic Aviation Corp., Farmingdale, L. I., N. Y., **SETH JOHNSON** is now with the Kellett Autogiro Corp., Upper Darby, Pa., as production design engineer.

G. E. RUCKSTELL has joined Taylor Engines, Inc., Oakland, Calif. Mr. Ruckstell was formerly a sales engineer for Remington-Rand, Inc., Washington, and was also connected with Ruckstell-Burkhardt Mfg. Co., Inc., Elmira, N. Y.

Hitler's bad judgment in planning for and building his air weapons, and his failure to follow up his advantages are costing him the war, **J. CARLTON WARD, JR.,** president of the Fairchild Engine & Airplane Corp. and president of the East Coast Aircraft War Production Council, declared recently. "Because Hitler failed to follow through after Dunkirk, because the Japs failed to march in after Pearl Harbor, because the aviation industry of Britain and America adopted the principle of day-to-day development and improvement of aerial combat craft to meet *all* types of aerial warfare, because the air strategists of Germany failed to foresee the necessity of fighting a defensive war, the victorious conclusion of this conflict seems to be in the not too distant future," Mr. Ward said.

WARREN K. LEE, who had been vice-president of the Wilkening Mfg. Co., with headquarters in Detroit, is now project manager and is located at the Wilkening Mfg. Co.'s office in Scranton, Pa.

JOHN C. HUBBARD is now an ensign in the U. S. Navy. He is an automotive maintenance officer at the Naval Air Station, Transportation Office, Patuxent River, Md.

General Motors Corp. recently announced that **C. R. OSBORN** has been elected a vice-president of the corporation, and will be in direct charge of the Electro-Motive Division at LaGrange, Ill.; also, **A. W. PHELPS** has been transferred from Electro-Motive to the Detroit headquarters; and **E. B. NEWILL** has been appointed general manager of the Allison Division in Indianapolis. Due to illness **F. C. KROEGER,** vice-president of General Motors, has been granted a leave of absence as general manager of Allison.

Formerly at the Naval Training School of Aeronautical Engineering, California Institute of Technology, Pasadena, Calif., **ENSIGN MICHAEL B. COMBERIATE,** A-V(S), USNR, can now be reached c/o Fleet Post Office at San Francisco.

CAPT. COLIN G. ROSS, formerly consulting engineer, is now on the Electrical and Mechanical Engineers Directorate, G.H.Q., M.E.F., P. O. Box 4618, Johannesburg, Transvaal, South Africa.

F. E. LA FEHR recently joined the Check-Chart Corp., Chicago. Mr. La Fehr, an SAE member since 1924, is a member of the Engineering Technical Staff, specializing in the analysis of lubrication information gathered in the field. Mr. La Fehr was an officer in World War I and saw service in France in command of a heavy mobile Ordnance repair shop.

Promotion of **ALFRED B. THACHER** from assistant project engineer to assistant

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No Civilian Automobiles in '44, Government Officials Agree

HIGH placed executives of the War Production Board have no part in the current rumors that civilian automobile production will return during 1944, despite the wide circulation of such opinions.

However, R. L. Vaniman, director of WPB's Automotive Division, announced that sufficient vital and reconditioned parts will be made available for the country's "30,000,000 motorists" to keep the nation's essential cars rolling through 1944. He estimated release of materials for $400 million of new parts.

Continued shortages of materials and huge military demands will continue the country in its period of materials shortages, according to top military and civilian executives. Toughest proponent of more and more production is Lt.-Gen. Brehon B. Somervell, Army Service Forces chief. Even bulking warehouses do not faze him, proponents of modified civilian production say.

An indication of a shift to civilian production, on the other hand, and a probable pattern of the shape of things to come, lies in the recent cutback of woolen cloth announced by the Quartermaster General with a revised WPB Limitation Order following fast on its heels. This permits a sizable increase in civilian woolen manufacture.

Although post-war planning by industry is decried by most of the top-ranking military and WPB officials, some units of WPB, Lend-Lease, and other Government agencies are busy on such plans themselves. Some of these officials who are thinking in post-war terms believe that the problem of retooling for peacetime should be studied now to prevent a disastrous economic melee when peace comes.

However, they point out that little clarification may be expected because of many unknown factors:

- Length of the war;
- Type of peace, including our share in world industrial rehabilitation;
- Labor market, depending upon our own casualties and the attitude of organized labor which will be strongly intrenched; and
- Tariffs and international treaties affecting our exports, among others.

Relaxation of materials controls, as in the case of woolen cloth, will stimulate interest by both Government and industry in resumption of civilian manufacture.

Until then WPB officials feel that the less said about post-war planning the better, despite their realizing that considerable engineering planning must precede actual retooling for post-war civilian manufacture.

Cites Vehicle Use Drop During Past Two Years

Within two years, count of motor vehicles on the highways of the country dropped from 100 to 40, the U. S. Public Roads Administration found by checks in 43 states as recorded by 559 automatic traffic recorders on rural roads.

IMPACT OF WAR ON INDUSTRY.

CMP Changes

Bills of Materials Face Revision, Easing Work

AUTOMOTIVE engineers may expect revisions in bills of materials instructions under WPB's Controlled Materials Plan soon. Many producers have been demanding complete bills from their suppliers on all war programs.

This was not the intention of WPB in permitting Claimant Agencies to require complete bills on their programs. Purpose of this revision in the Bills of Materials instructions was to permit Claimant Agencies to require complete bills on major repetitive programs.

This is significant to plant engineers who are called upon to prepare complete bills, including Class B product requirements, inasmuch as it will lessen their work load in a good many instances.

General idea planned for the revision is to permit persons from whom complete bills are requested to check with the claimant in order to determine whether or not the complete bill has actually been requested.

In some instances, it is felt by WPB officials, requests for complete bills are being made by concerns to acquire information which they have wanted for some time, and which they have been unable to obtain from their suppliers.

Intention of the CMP Division is to eliminate this type of post-war planning.

Carbide Patents Given For Free Use To All

General Electric Co. has assigned to the Alien Property Custodian 37 patents covering cemented and sintered carbides, making them available for royalty-free, non-exclusive use by American industry. These patents were originally acquired from Fried Krupp Aktiengesellschaft, Germany.

Custodian Leo T. Crowley also controls, in the name of the United States, 16 other carbide tools and process patents. Applications for the use of any or all of these patents should be made to the Office of Alien Property Custodian, Washington.

Industry's 'Firsts' Cited By WPB's R. L. Vaniman

Without disclosing detailed figures currently guarded as military secrets, R. L. Vaniman, director, WPB's Automotive Division, announced that the automobile industry today is the largest producer in America of:

- Antiaircraft guns and shells;
- Gun mounts;
- Diesel engines;

Also, he said, the industry is the world's largest producer in the world of gyro compasses, makes the most of all types of airplane engines, and is the world's largest producer of machine guns and ammunition.

It is the second largest producer in the nation of shell casings, and is one of the largest of the nation's producers of airplane fuselages and wing services.

Beside this, its production of military vehicles of all kinds, including tanks and amphibious landing craft, is unprecedented in the world.

In June the annual rate of armament production by the automotive industry reached an all-time high of $8.7 billions, as compared with a peacetime peak of $3.7 billions.

To Aid Management In Production Gains

Executive Vice-Chairman Charles E. Wilson has named John W. Nickerson, general

superintendent of textile mills, as director of the new WPB Management Consultant Division. The division's functions:

- Collaboration with the Labor Production Office of WPB to find methods of increasing production of munitions through better industrial relations and improved management practices with special emphasis upon:
- Wage incentive plans, and
- Production standards.

Cartage Firms In Pool

The first local cartage joint-action plan submitted to ODT came from two firms in Cincinnati, approved under Order 6A. Loads will be be pooled and manpower and equipment will be exchanged in the interest of saving vehicles, gasoline, tires, and labor.

Short

Materials In Sight Run Under Requests

MILITARY and essential civilian demand for critical metals still outruns available supplies in fourth-quarter allotments of controlled materials, just completed by the WPB Requirements Committee.

Carbon steel supplies were the controlling factor in making allotments of copper, aluminum and alloy steels, but the other controlled materials are still extremely tight. Copper production, particularly, is still affected by serious manpower shortages.

The fourth quarter available supplies were divided among the 16 claimant agencies representing military and civilian requirements, Lend-Lease and other exports. More realistic production programming is reflected by the fact that the overall reduction of the claimant's total requests amounted to only 13%.

In making third-quarter allotments last spring, it was necessary to lop off a total of 25% to keep production schedules within available supplies.

Requests of the Army, Navy, Aircraft Resources Control Office and Maritime Commission for carbon steels, taken together, were reduced by about 9% in the allotments. All other requests, including those for export, were reduced about 17%.

Farm and Exports Up

The Office of Civilian Requirements received a somewhat larger allotment than was made for its purposes in the third quarter, and an earmarked account in the Lend-Lease allotment is reserved for the manufacture of farm machinery to be used as needed by the Office of Foreign Relief and Rehabilitation in occupied countries.

Total requests from claimant agencies for carbon steel amounted to slightly more than 19,500,000 tons, as against an estimated fourth-quarter supply of a little under 15,500,000 tons, representing a deficit of about one-fifth. The allotments are final and will not be reopened, WPB said.

"It is of equal importance to maintain the health and welfare of the soldier on the fighting front and the worker on the home front. Production of goods for both is the responsibility of the War Production Board," Chairman Donald M. Nelson said.

"It is the function of the Army and Navy to determine the essential articles that must be produced for our fighting men – and the quantities of each article that are necessary.

OCR's Task

"It is the function of the Office of Civilian Requirements to determine the essential articles that must be produced for civilians – and the quantities of each.

"Various discussions anent 'bedrock economy' as against free manufacture of civilian goods lose sight of this basic policy. If it becomes necessary to produce a given quantity of cook stoves, or farm machinery, or whatever, to maintain civilian health and welfare, we are going to produce them regardless of the scarcity of the materials involved," he added.

Shortages Are Index

"We are not going to open the manufacture of less essential articles as long as materials continue tight.

"That is the policy of the War Production Board and a policy with which the leaders of the interested agencies of Government are in complete agreement. We have no intention of deviating from it."

Arsenal

$14½ Billion Program Nearing Its Completion

FOUR-FIFTHS of the huge Government-financed war facilities program was completed by midyear, WPB's Chairman Donald M. Nelson announced.

By the end of June, $12,038,000,000 worth of facilities had been completed, with $2,544,000,000 to go in the $14,582,000,000 program, he said.

Highlights:

- Ninety-five per cent of the ammunition and explosives program was completed, the remainder being near completion;
- Sixty-one per cent of the synthetic rubber facilities were completed, as against 3% a year ago June 30, and 15% at the beginning of this year;
- Thirty-nine per cent of the 100-octane gasoline facilities were completed, as compared with less than 1% completed as of Jan. 1, 1943. Even greater increase, percentagewise, was chalked up by private industry with 63% of the privately financed facilities completed, he pointed out.
- Seventy-five per cent of the iron and steel facilities program has been completed, and
- Ninety per cent of the chemical facilities program was completed by midyear.

Mr. Nelson pointed out that this record of achievement means more steel, and other critical materials, as well as many manufacturing facilities employed on this construction program, can soon be diverted 100% to the actual manufacture of armaments.

Diamond Dies Found To Be Sufficient

A brand new diamond die industry has been created in this country because of early-felt shortage of fine copper wire for electrical equipment. Experience in England, amplified by industrial development here, succeeded in drilling diamonds by machinery with the result that the military requirement for electrical coils and other apparatus will be met, according to WPB.

An experimental laboratory was set up in the National Bureau of Standards to improve wire drawing processes and to prolong the life of dies. From 25,000 to 30,000 dies will be available to industry as a result of these efforts which gave birth to a post-war industry through military necessity.

Antifreeze Grade Labeling Is Out

Office of Price Administration Amendment 6 (Aug. 16) to Maximum Price Regulation 170 withdraws grade labeling requirements on antifreeze in conformity to

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Section Officers 1943-1944

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Co.; secretary: **John R. Cox**, vice-president, Weatherhead Co.

Detroit

Chairman: **A. G. Herreshoff**, chief engineer, research, Chrysler Corp.; vice-chairman, Aeronautics: **Don R. Berlin**, aeronautical engineer, General Motors Corp.; vice-chairman, Passenger Car: **Max M. Roensch**, experimental engineer, Chrysler Corp.; vice-chairman, Passenger-Car Body: **Frank S. Spring**, engineer, Hudson Motor Car Co.; vice-chairman, Production: **D. S. Harder**, general factory manager, Fabricating Division, Fisher Body Division, General Motors Corp.; vice-chairman, Junior-Student Activity: **Burton C. Erickson**, assistant project engineer, Aircraft Engine Division, Packard Motor Car Co.; vice-chairman, Regional: **E. M. Schultheis**, Detroit representative, Clark Equipment Co.; treasurer: **F. W. Marschner**, Western sales manager, New Departure Division, General Motors Corp.; secretary: **Ronald J. Waterbury**, body engineer, Chevrolet-Central Office.

Indiana

Chairman: **Roy W. Paton**, experimental engineer, Perfect Circle Co.; vice-chairman: **C. H. Wallerich**, president, C. H. Wallerich Co.; vice-chairman: **Clifford M. Rigsbee**, work room superintendent, L. S. Ayres & Co.; treasurer: **Robert C. Wallace**, vice-president, Marmon-Herrington Co., Inc.; secretary: **Harlow Hyde**, Indianapolis.

Kansas City

Chairman: **Donald S. Flynn**, assistant division manager, Ethyl Corp.; vice-chairman: **Carl M. Berry**, field engineer, Ethyl Corp.; vice-chairman, Aeronautics: **J. R. Kessler**, Pratt & Whitney Aircraft Corp. of Mo.; vice-chairman, Fuels and Lubricants: **L. J. Barney**, automotive engineer, Socony-Vacuum Oil Co., Inc.; treasurer: **Howard F. Dougherty**, assistant shop foreman, Kansas City Power & Light Co.; secretary: **Robert W. Rummel**, senior engineer, Transcontinental & Western Air.

Metropolitan

Chairman: **Elbert E. Husted**, president, Titeflex Metal Hose Co.; vice-chairman: **Robert H. Clark**, general superintendent, transportation, Consolidated Edison Co. of N. Y., Inc.; vice-chairman, Aeronautics: **R. Dixon Speas**, assistant to vice-president of engineering, American Airlines, Inc.; vice-chairman, Diesel Engines: **Charles F. Foell**, editor, *Diesel Power & Diesel Transportation*, Diesel Publications, Inc.; vice-chairman, Fuels & Lubricants: **George H. Freyermuth**, assistant manager, Engineering Division, Sales Department, Standard Oil Co. of N. J.; vice-chairman, Passenger-Car & Body: **Harold F. Blanchard**, technical editor, *Motor Magazine;* vice-chairman, Transportation & Maintenance: **N. A. Jorgensen**, manager, N. Y. Branch, Gar Wood Industries, Inc.; vice-chairman, Student Activity: **Jack O. Charshafian**, assistant project engineer, Wright Aeronautical Corp.; treasurer: **Ervin N. Hatch**, sales engineer, American Brakeblok Division, American Brake Shoe & Foundry Co.; secretary: **Kenneth Kasschau**, assistant project engineer, Wright Aeronautical Corp.

■ Mid-Continent

Chairman: **Carl A. Tangner,** president, general manager, Diesel Power & Machinery Co.; vice-chairman: **W. H. Emmons,** general plant manager, Braden Winch Co.; treasurer: **John H. Baird,** sales engineer, manager, Mid-West Division, Lubri-Zol Sales Co.; secretary: **Arch L. Foster,** associate editor, Petroleum Publishing Co.

■ Milwaukee

Chairman: **Robert I. Dick,** engineer, Murphy Diesel Co.; vice-chairman: **Theodore L. Swansen,** engineer, Manufacturing Department, Allis-Chalmers Mfg. Co.; treasurer: **Charles T. O'Harrow,** Allis-Chalmers Mfg. Co.; secretary: **Lloyd L. Bower,** installation engineer, Waukesha Motor Co.

■ New England

Chairman: **James F. Shannon,** service manager, Autocar Sales & Service Co.; vice-chairman: **Alfred Markus,** general manager, treasurer, Markus Motor Service, Inc.; treasurer: **Albert Lodge,** proprietor, Goodrich Oil Sales Co.; secretary: **Eben N. Smith,** New England manager, United Motors Service, Inc.

■ Northern California

Chairman: **Dr. Alfred G. Cattaneo,** research engineer, Shell Development Co.; vice-chairman: **S. E. Onorato,** automotive engineer, Fuels & Lubricants Division, Union Oil Co. of Calif.; vice-chairman, Aeronautics: **R. Wayne Goodale,** research engineer, Standard Oil Co. of Calif.; vice-chairman, Diesel Engine: **Roy A. Hundley,** chief engineer, Enterprise Engine & Foundry Co.; vice-chairman, Fuels & Lubricants: **John T. Ronan,** research engineer, Shell Oil Co., Inc.; vice-chairman, Transportation & Maintenance: **Lewis A. Schroyer,** superintendent of maintenance, Yellow Cab Co.; treasurer: **Charles A. Winslow,** president, Winslow Engineering Co.; secretary: **Avon Brown,** design draftsman, Hall-Scott Motor Car Co.

■ Northwest

Chairman: **Wilson E. Davenport,** assistant division manager, Union Oil Co. of Calif.; vice-chairman: **Lee Ketchum,** Kenworth Motor Truck Corp.; vice-chairman, Spokane District: **Spencer H. Hawley,** vice-president, general manager, Auto Interurban Co.; treasurer: **W. R. Clark,** shop superintendent, North Coast Transportation Co.; secretary: **D. D. Thomasson,** sales engineer, The Texas Co.

■ Oregon

Chairman: **Zenon C. R. Hansen,** retail sales manager, International Harvester Co.; vice-chairman: **James P. Tretton, Jr.,** superintendent of equipment, Portland Traction Co.; vice-chairman, Students: **W. H. Paul,** associate professor, mechanical engineering, Oregon State College; treasurer: **L. J. Cronkhite,** branch manager, Fruehauf Trailer & Equipment Co.; secretary: **George H. Ohler,** president, Automotive Products, Inc.

■ Philadelphia

Chairman: **G. Ralph Strohl,** special equipment engineer, Autocar Co.; vice-chairman: **Franklin C. Burk,** superintendent, automotive laboratory, Atlantic Refining Co.; treasurer: **Paul E. Friend,** chief engineer, Wilkening Mfg. Co.; secretary: **Theodore Brinton Hetzel,** assistant professor, Haverford College.

■ Pittsburgh

Chairman: **Allen J. Imblum,** vice-president, Pittsburgh Auto Spring Co.; vice-chairman: **S. G. Page,** general superintendent, Equitable Auto Co.; vice-chairman, Oil City District: **D. G. Proudfoot,** Sales Engineering Department, Pennzoil Co.; treasurer: **Charles W. Butler,** automotive engineer, Gulf Research & Development Co.; secretary: **Norman H. Werner,** estimator, Ed. Werner Transfer & Storage Co.

■ St. Louis

Chairman: **Frederick H. Roever,** superintendent, aeronautical engineering and executive schools, Parks Air College; vice-chairman: **George C. Davies,** Socony-Vacuum Oil Co., Inc.; treasurer: **Alfred F. Stoehr,** associate engineer, U. S. Army, St. Louis Ordnance District; secretary: **George L. Gaston,** automotive engineer, Standard Oil Co. (Ind.).

■ Southern California

Chairman: **Wallace Linville,** chief automotive engineer, General Petroleum Corp. of Calif.; vice-chairman: **George Tharratt,** chief engineer, Adel Precision Products Corp.; vice-chairman, Aircraft: **T. D. MacGregor,** liaison engineer, Douglas Aircraft Co., Inc.; vice-chairman, Aircraft Engines: **Thomas F. Bergmann,** sales representative, Wright Aero, Ltd.; vice-chairman, Fuels &

Lubricants: Gerthal French, manager, Lub. Sales Department, Richfield Oil Corp.; vice-chairman, Transportation & Maintenance: **Lee Hinson, Jr.,** transportation manager, Paramount Pictures, Inc.; vice-chairman, San Diego District: **Edmund T. Price,** president, general manager, Solar Aircraft Co.; treasurer: **Charles H. Jacobsen,** senior engineer, Transportation Department, State of California, Railroad Commission; secretary: **Ray Sanders,** vice-president, general manager, Turco Products, Inc.

Southern New England

Chairman: **Charles A. Morss,** designer, Pratt & Whitney Aircraft, Division United Aircraft Corp.; vice-chairman: **Dwight R. Judson,** president, Dwight R. Judson Co.; vice-chairman, Aeronautics: **Carl F. Baker,** assistant chief engineer, Hamilton Standard Propellers Division, United Aircraft Corp.; treasurer: **T. C. DeLaval-Crow,** chief engineer, New Departure Division, General Motors Corp.; secretary: **Kenneth I. Bird,** charge production test department, Pratt & Whitney Aircraft, Division United Aircraft Corp.

Southern Ohio

Chairman: **Charles Robert Talmage,** mechanical engineer, A. Robert Snyder Co.; vice-chairman, Dayton District: **John F. Haines,** assistant chief engineer, Aeroproducts Division, General Motors Corp.; vice-chairman, Columbus District: **Karl W. Stinson,** professor of automotive engineering, Ohio State University; vice-chairman, Cincinnati District: **W. E. Burnham,** vice-president, chief engineer, Freedman-Burnham Engineering Corp.; secretary-treasurer: **John S. Maloney,** research engineer, Aero Supply Mfg. Co., Inc.

Texas

Chairman: **Harold F. Schwedes,** factory manager, North American Aviation, Inc. of Texas; vice-chairman: **William E. Lind,** engineering assistant to executive vice-president, Guiberson Diesel Engine Co.; vice-chairman, Fort Worth District: **Donald D. Waller,** staff engineer, Consolidated Vultee Aircraft Corp.; treasurer: **Stephen Vincent Jay,** lubrication engineer, Humble Oil & Refining Co.; secretary: **Albert J. Dolan,** owner, Dolan Aircraft Mfg. Co.

Washington

Chairman: **James A. Allan,** owner, James A. Allan Co.; vice-chairman: **Major H. R. Higgins,** U. S. Army Ordnance Department, Field Service Division; vice-chairman, Norfolk District: **H. J. E. Reid,** engineer in charge, National Advisory Committee for Aeronautics; treasurer: **Clarence S. Bruce,** automotive engineer, National Bureau of Standards; secretary: **Curt Saurer,** consulting engineer, Washington.

Wichita

Chairman: **D. T. Evans,** Lubrication Department, Globe Oil & Refining Co; vice-chairman: **J. J. Clark,** assistant chief engineer, Boeing Airplane Co.; secretary-treasurer: **Mitchell Zurawinski,** design engineer, Cessna Aircraft Co.

Colorado Group

Chairman: **J. D. Sullivan,** manager, sales, Commercial Steel Products, Colorado Fuel & Iron Corp.; vice-chairman: **Paul E. Waggoner,** general service manager, Safeway Stores, Inc.; secretary-treasurer: **Miss Marian Higgins,** Denver.

Mohawk-Hudson Group

Chairman: **Donald K. Wilson,** superintendent, automotive equipment, N. Y. Power & Light Corp.; vice-chairman: **Bruce Crane,** Ethyl Corp.; secretary-treasurer: **Robert L. Stanley,** instructor, engineering, Union College.

Muskegon Club

Chairman: **Paul S. Lane,** research engineer, Muskegon Piston Ring Co.; vice-chairman: **Clark E. Wheaton,** metallurgist, Continental Aviation & Engineering Corp.; secretary-treasurer: **Harold Rosen,** owner, American Grease Stick Co.

Peoria Group

Chairman: **Edward W. Jackson, Jr.,** assistant to president, Caterpillar Tractor Co.; vice-chairman: **J. M. Davies,** assistant director of research, Caterpillar Tractor Co.; treasurer: **Kenneth M. Brown,** experimental engineer, Caterpillar Tractor Co.; secretary: **Harry W. Fall,** research engineer, Caterpillar Tractor Co.

Twin City Group

Chairman: **W. E. Swenson,** agricultural and industrial engine design, Minneapolis Moline Power Implement Co.; vice-chairman: **Wilfred W. Lowther,** chief engineer, Donaldson Co., Inc.; secretary-treasurer: **Thomas Edward Murphy,** instructor, University of Minnesota.

NEW MEMBERS Qualified

These applicants who have qualified for admission to the Society have been welcomed into membership between July 10, 1943, and Aug. 10, 1943.

The various grades of membership are indicated by: (M) Member; (A) Associate Member; (J) Junior; (Aff.) Affiliate Member; (SM) Service Member; (FM) Foreign Member.

Baltimore Section: Henry W. Cooper (J), Sidney Helfman (J), T. Blair Middleton (A), A. R. Ruth (A), Edwin Herman White (M).

Buffalo Section: Arthur Baitz (J), John L. Drew (M), Douglass Fennell Evans (M), Wilmer E. Goode (A).

Canadian Section: Ronald C. Beckett (M), Stanley L. Coleman (A), A. Wallace Denny (M), Vincent O. Griffin (J), George Ernest Robertson (A).

Chicago Section: George D. Bennett (J), Henry Bjelland (S M), Daniel Brown (J), David Chrispens, Jr. (J), Alvin Beecher Copeland (J), August Faller, Jr. (J), Jack C. Fetters (M), Edward Stanley Gabrisko (J), William J. Harris (M), Robert M. Hirsch (J), Robert F. Kunkler (A), Robert M. Nichols (M), Melvin R. Nicholson (A), Frederick Osann, Jr. (J), A. J. St. George (A), Frank W. Sauger (A), Samuel L. Sola (J), Woodrow Tichy (J).

Cleveland Section: Russell G. Anderson (M), Wayne Elton Blackmun (J), Earle P. Bollenbacher (A), John H. Briggs (A), Howard F. Calvert (J), Fred J. DiTirro (A), Irving C. Ehlke (A), Samuel Stanford Manson (J), Robert D. Peter, Jr. (J), C. Earl Sutter (M), John E. Tereschuk (M).

Colorado Club: Edgar Lee Elder (M).

Detroit Section: Ralph Bertsche, Jr. (M), John Castle (M), James Harold Foote, Jr. (J), Gilbert L. Galmish (M), Clesson W. Genson (M), Wilbur L. Goehmann (J), Jack Charles Gordon (A), T. W. Hoover (M), Robert A. Huber (A), Robert June (M), Wallace O. Leonard (M), Robert Hall Loughran (J), Charlton F. Mills (M), Cleveland F. Nixon (M), F. J. Norton (J), Rodman J. Osplack (J), Nicholas J. Rakas (M), A. E. Shelton (A), Capt. Omar H. Somers (S M), John McClure Stone (J), Joseph Charles Sutton (J), John Dale Thompson (M), Byron A. Thorpe (M), A. G. Tsongas (M), Clarence A. Van Dell (M), George H. Van Husen (M), Chris H. Will (J), Durward E. Willis (M), Melvin A. Wilson (M).

Indiana Section: Max G. Bales (M), Jack Barnes (A), Albert C. Bell (M), Adelbert (Al) Wm. Putnam (A), Oliver P. Smith, Jr. (J), Alexander C. Wall (M).

Metropolitan Section: Edward Christian Bauer (A), Thomas J. Colleran (M), Raymond R. Davis (M), Forrest L. Dorman (J), Milton Frank Edwards (A), Ivan B. Friedman (J), Ralph M. Guerke (M), Josef Karl Hoenig (J), A. N. Kemp (A), Russell C. Kuhn (A), Leonard Laurence Maitland (J), Robert McLarren (J), George M. McNulty (M), R. Wendell Miller (M), John G. Pepe (A), S. Joseph Shefrin (J), Rainer G Siener (A), Robert E. Snyder (A), Andrew George Staller (M), Robert K. Tiedeman (J), Charles S. Van Sickle (A), Donald A. Voorhies (J), John F. Weidner (A), Felix Edgar Wormser (A), Wilbur W. Young (A), Alexander Zeitlin (M).

Mid-Continent Section: Orville Joseph Church (A).

Milwaukee Section: Frank Adams (M), Joseph Frank Barthlemess (M), Thomas William Pleyte (J), Daniel F. Semlak (J), Glen Allen Spraker (A).

Mohawk-Hudson Group: Raymond D. Mires (M).

Muskegon Club: L. W. Kibbey (M).

New England Section: Richard Philip Arms (J), Grant C. Ehrlich (J).

Northern California Section: Gunner Laurits Scholer (J).

Northwest Section: Albert E. Abbott (A), Armond M. Baump (A), Edward H. Brewitt (A). John I. Florey (A), Harold Sterling Gladwin, Jr. (M), Walter Lyman MacArthur (A), Loren W. McCormick (A), James Douglas Musgrove (J), Howard Platt (A).

Oregon Section: Major Clyde L. Falls (S M), William M. Stover (A).

Peoria Group: Erwin John Herman Bentz (J), George P. Fenn (M).

Philadelphia Section: Francis J. Borowsky (A), Linn Edsall (M).

Southern California Section: Jerome F. Beardsley (A), Robert M. Berns (J), Harry Brown (A), M. J. Charles (J), John C. Dillon (A), Donald Wills Douglas, Jr. (J), John O. Findeisen, Jr. (J), Wendell S. Fletcher (M), Robert Henry Fowble (J), John Clifford Garrett (M), Alfred Mynderse Goldman (A), Robert S. Lemm (A), A. Nelson Marquis (J), Capt. Robert L. Menefee (A), Charles Sibley Morgan (A), Robert E. Reedy (M), Frederick Henry Rice (J), Rohr Aircraft Corp. (Aff.) Reps: E. M. Lacy, Kermit W. Maynard, Frank E. McCreery, Jr., Burt F. Raynes, J. E. Rheim, Fred H. Rohr. Morlan A. Visel (J), John A. Wills (J).

Southern New England Section: H. P. Cleaver (M), John Donald MacCarthy (M), Stanley J. Markowski (J), James R. Thomson (M).

Southern Ohio Section: W. W. Cary, Jr. (J), Dr. Anson Hayes (M), Lawrence Richard Tallman (J).

Syracuse Section: Frank T. Christian (M), Lewis E. Pierson, Jr. (A), Clifford L. Reals (M).

Texas Section: Anton R. J. Friedmann (A), Holt E. Owen (A), J. F. Schenewerk, Jr. (A), R. G. Taylor, Jr. (A), Oscar Neil Thompson (M).

Twin City Group: Bernard Ralph Eschweiler (J), J. C. Hoiby (M), Albin L. Lee (J).

Washington Section: Lucien Warner Bingham (A), William C. Howard (M), Ardis F. McDougald (M), Afton D. Puckett (S M), Clarence Henry Rauschenberg (A), Charles Ray (A), Charles W. Wood (M).

Wichita Section: William F. Wright (J).

Outside Section Territory: Ensign Jack Leland Alford (J), Frederick T. Brooks (J), Willis Merle Carter (M), Major George Arthur Chadwick, Jr. (S M), George Henry Gibbs (A), Clyde E. Holvenstot (J), Frederick B. Malling (J), W. E. Martin (M), Capt. David H. Mikkelson (J), George M. Russel (J), George Douglas Simonds (M), 2nd Lt. William F. Williams (A).

Foreign: Harold William John Bent (F M), (England), Capt. B. Chatterjee (F M), (India), Alfred Harvey (F M), (England), John Bertram Perrett (F M), (England), Major Alfred Graham Steele (F M), (England).

APPLICATIONS Received

The applications for membership received between July 10, 1943, and Aug. 10, 1943, are listed below. The members of the Society are urged to send any pertinent information with regard to those listed which the Council should have for consideration prior to their election. It is requested that such communications from members be sent promptly.

Baltimore Section: John T. Gosnay.

Canadian Section: Philippe Moquin.

Chicago Section: Walter E. Biedron, Thomas Edward Boyd, Harry E. Chew, William J. Evers, Paul R. Kolbe, Edward F. Obert, James W. Starrett, Jr.

Cleveland Section: Christie Batlas, Kenneth S. Kleinknecht, Elmer Molnar, Max Don Peters, Carl R. Reuter, C. O. Slemmons, Frederic Earl Smith, George Thoma.

Detroit Section: H. Y. Bassett, Philip S. Blowey, Paul F. Craig, Wayne Ewing, Philip J. Fobert, Richard A. Hameister, Joseph A. Murray, Harry Pelphrey, James M. Ryan, Fritz Emil Sandberg, Otto J. Snider, Edgar C. Storms.

Indiana Section: Herman L. Hartzell.

Metropolitan Section: Benjamin William Beckman, Kenneth E. Blanchard, Harold M. Burdick, Theodore Chanoux, Robert R. Dexter, David Charles Fehleisen, E. J. Foley, Louis Eugene Freeman, Gene F. McConnell, Leonard Meyerhoff, Charles Moyses, Lucien F. Pichenot, James M. Robinson, Will C. Sievert, John F. Taplin, Edward H. Yulke.

Mid-Continent Section: James F. Frye, John G. Kirkhuff, Henry R. Kroeger.

Milwaukee Section: Howard F. Doll, William J. Harley, Forrest Eugene MacDonald.

New England Section: Capt. Stanley M. Smolensky.

Northern California Section: John M. Fowle, Richard C. Holroyd, Charles V. Johnson, Lt.-Col. Willis S. Wells.

Northwest Section: V. A. Parker, Arthur M. Rhodes.

Oregon Section: Rupert E. Perry, Leslie O. Vogel.

Peoria Group: Eugene R. Alford, John W. Kendrick, Mitchell McMurray.

Philadelphia Section: Paul Doxey, Arthur O. Froelich, Lloyd Richard Maxwell.

Southern California Section: Ben Taylor Anderson, L. S. Barksdale, Lewis W. Cate, Charles J. Daubenberger, John E. Ekstromer, Jr., John C. Finger, I. H. Grancell, Lawrence A. Harvey, John MacGregor Logan, Charles E. McCuan, Robert L. Muth, Arthur P. Swift, Jr., Charles Lewis Tanner, Howard R. Trissel, W. A. Witham.

Southern New England Section: Rex Albert Horrocks, Arnold B. Medbery, Jr., Gerhard G. Thiem.

Southern Ohio Section: John Wright Hickenlooper.

Syracuse Section: Frank J. Tarnacki.

Texas Section: Emmett W. Hauth, John G. Oechsner, Hermann Schaar.

Twin City Group: LeGrande H. Lull, Thomas G. Valenty.

Washington Section: Ensign John L. Hacker, Hal H. Strouse, Franklin A. Wilkins.

Outside Section Territory: Walter Castles, Jr., H. J. Hamernik, Emil T. Johnson, H. B. Jossel, Merton J. Stevens, Major Leo Tamamian.

Foreign: Phillip Draper (England), Roderick Athelstane Keir (New Zealand), Alfred John Thorne (England).

About SAE Members

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chief installation engineer, Hamilton Standard Propellers, Division of United Aircraft Corp., East Hartford, Conn., recently took place.

HARVIE H. STRAWN, International Harvester Co., Inc., Chicago, has been promoted from service supervisor, New York City District, to assistant service manager of motor trucks, Chicago.

HAROLD M. TRIMBLE has been made associate director of the Research Department, Phillips Petroleum Co., Bartlesville, Okla. Mr. Trimble was formerly research engineer for the same company.

ENSIGN WILLIAM W. WATSON is now in the U. S. Navy, stationed at the U. S. Naval Air Station, Quonset Point, R. I. Before entering military service, Ensign Watson was in the Engineering Department of Chevrolet Motor Division, General Motors Corp., Flint, Mich.

Photographs showing how air really flows over airfoils and other parts of the airplane are the main feature of a new book by **C. TOWNSEND LUDINGTON,** associate director in charge of aviation, Franklin Institute, Philadelphia. These photographs (125 in all) were taken at the Griswold Smoke Tunnel, largest two-dimensional smoke tunnel in use, and capable of airflow speeds up to 80 mph. Twenty-four individual smoke streams injected into the air moving through the tunnel make it possible to visualize airflow over the models. Mr. Ludington has illustrated in this volume: the working of Bernoulli's principle; flow over various airfoil sections, slots, and flaps; downwash effects; flow around automobiles and sail boats; flow over buildings with and without roof spoilers (used to spoil the airflow, so that the roof won't be sucked off by a high wind); and many other interesting phenomena. The volume, entitled "Smoke Streams," is published by Coward-McCann.

M. T. WOODCOCK, flying officer and engineer, formerly in the RAF Volunteer Reserve, Officers' Mess, RAF Station, Greenwood, Kings Company, Nova Scotia, is now at the Officer's Mess RAF Station, Kingston, Ont.

Jack R. Douglass

JACK R. DOUGLASS, Oklahoma A & M College, Stillwater, class of '43, was awarded a $150 cash prize by the James F. Lincoln Foundation of Cleveland in a competition held annually among engineering students in American colleges and universities. The subject of his paper was "An Adaptable Low-Cost Fume Exhauster for Welding Shops."

J. E. KLINE has accepted a position as project engineer with the Dodge Chicago Plant, Division of Chrysler Corp. Mr. Kline was connected with the Standard Oil Co. (Ind.), Whiting, as automotive research engineer.

B. D. McINTYRE has left the War Production Board, Washington, where he was chief of the Light Ordnance Section. Mr. McIntyre is president of the Monroe Auto Equipment Co., Monroe, Mich.

MAJOR HARRY PRICE, formerly a captain at the Command & Staff School, Macon, Ga., can now be reached through A. P. O. 634, c/o the Postmaster, New York.

EUGENE B. LASKIN, National Advisory Committee for Aeronautics, has been transferred from Hampton, Va., to the NACA Aircraft Engine Research Laboratory in Cleveland. Mr. Laskin is associate mechanical engineer.

Formerly assistant maintenance officer, U. S. Army Service Company, 32nd Infantry, Fort Ord, Calif., **WILBERT M. SCOTT,** warrant officer, can now be reached c/o Postmaster, Seattle, Wash.

CLAUDE C. CROSIER is now district engineer for the Torrington Co. He is at the company's main headquarters in Torrington, Conn. Mr. Crosier had been service engineer for the same company in Milwaukee.

HAROLD J. ROBINSON has been temporarily assigned to supervise the manufacturing and assembly of the anti-aircraft gun director at the Director Division, Ford Motor Co., Highland Park, Mich. He had been general superintendent of the Lincoln Motor Division of the Ford Motor Co., Detroit.

M. M. DANA, USN, has been promoted from lieutenant commander to commander, and was transferred from the Navy Yard at Pearl Harbor, T. H., to the Navy Yard at San Francisco, Calif.

C. S. PHILLIPS, formerly of the John Bean Mfg. Co., Lansing, Mich., is general manager of the newly-organized Detroit advertising agency, Florez, Phillips & Clark. As a division of the Visual Training Corp., sales promotion and technical training organization, the agency will offer the facilities of an extensive staff of specialists in a wide range of technical fields.

C. S. Phillips

Although predicting a big post-war automobile market, **HARRY WOODHEAD**, president of Consolidated Vultee Aircraft Corp., said in Detroit recently that he does not expect more than 20% of the aviation industry's present facilities to be used for post-war plane production.

Formerly a lieutenant, and company commander, U. S. Army, 318th Engineer Battalion at Fort Nuachucal, Ariz., **T. E. OTHMAN** has been promoted to major. He is stationed in the 207th Engineer Battalion at Camp Swift, Tex.

LT. WESLEY E. JOHNSON, who had been in the U. S. Army Air Forces at Wright Field, Dayton, Ohio, is now with the Eastern Procurement District, Inspection Section, New York City.

Formerly New York manager of the White Motor Co., **G. TAYLOR MYERS** has entered military service as a major in the U. S. Army. Major Myers is in the Ordnance Department with headquarters in Chicago.

T. A. Boyd

T. A. BOYD, head of the fuel department, research laboratories division, General Motors Corp., was elected president of The Engineering Society of Detroit. Mr. Boyd was co-discoverer along with SAE members **CHARLES F. KETTERING** and **THOMAS MIDGLEY, JR.**, of antiknock compounds, including the organic compounds of lead used in ethyl gasolines and in a large portion of all automobile gasolines now sold.

HARRY N. TAYLOR is no longer in the Research Laboratory, Standard Oil Co. (Ind.). He is now in the development engineering department of United Airlines Transport Corp., Chicago.

GENNAD A. GREAVES, a colonel in the Ordnance Department of the U. S. Army, is chief of the Inspection Branch, Training Division, Office of Chief of Ordnance, Washington.

LT. CHARLES H. MARTENS, USNR, has been transferred from the U. S. Naval Air Station at Quonset Point, R. I., to the Bureau of Aeronautics, Navy Department, Washington.

WILLIAM R. HOPKINS is now employed as an engineer in charge of the Gasoline Injection Laboratory of the American Bosch Corp., Springfield, Mass. Mr. Hopkins was employed by the Lycoming Division of The Aviation Corp., Williamsport, Pa., during the past eight years, the last three of which he was chief experimental engineer.

Formerly a captain in the U. S. Army Air Forces, Wellstone Air Depot, Macon, Ga., **C. E. BATSTONE** has been promoted to major. Major Batstone is in the 38th Air Depot Group, A. P. O. 528, c/o Postmaster, New York.

Formerly service representative, Consolidated Vultee Aircraft Corp., Nashville, Tenn., **ROBERT JAMES KRAUSE** is now a technician for this company, and expects to be out of the country for the next year. His address is A. P. O. 886, c/o Postmaster, New York.

SAE student members who have recently entered military service include: **ENSIGN JAMES R. DIECKMANN**, USNR, formerly University of Wisconsin; **CARROLL F. WITTENBERG**, formerly Aeronautics Industries Technical Institute, Los Angeles, now in the U. S. Navy, Headquarters Company 99th Construction Branch, Camp Endicott, Davisville, R. I.; **LT. FRANK R. YOUNG**, U. S. Army, Headquarters 1st T. D. Brigade, Camp Claiborne, La., formerly A & M College of Texas; **ENSIGN E. G. HARRIS**, E-V (S), USNR, graduate of University of California; **JOHN W. BACON, JR.**, graduate of California Institute of Technology, now an aviation cadet in the U. S. Army Air Forces; **DAVID COLEMAN**, formerly Aeronautic Industries Technical Institute, now in the Air Corps; **2ND LT. LYNN MAXWELL**, graduate of A & M College of Texas, now in Battery B, 512th Coast Artillery Battalion, Camp Edwards, Mass. **F. FIESSELMANN**, formerly a student at General Motors Institute, has been sent to the Army-sponsored college in New Mexico for a mechanical engineering course in the Army Specialized Training Program; **VERL OWEN PARRISH**, formerly Oregon State College, is now a U. S. Naval Reserve; **NORMAN E. FINCK**, formerly A & M College of Texas, has been called to active duty in the U. S. Army; **CLYDE C. FRANKLIN**, formerly A & M College of Texas, is now an officer candidate in the U. S. Army; **PRIVATE JOHN L. COCHRAN**, formerly A & M College of Texas, now in Company A, 1st Ordnance Training Regiment, at Aberdeen Proving Ground, Md.;

Also, **WILLIAM C. BRERETON**, formerly Lawrence Institute of Technology, now in the 53rd Training Group, 169th Squadron, Air Corps Technical School, Keesler Field, Miss.; **PRIVATE E. MALANYN**, formerly Lawrence Institute of Technology, now in the Army Air Forces Technical Training College at the State University of Iowa; **PRIVATE DONALD E. LOVELACE**, formerly California Institute of Technology, now in the Army Specialized Training Unit at Ohio State University; **WILLIAM JAMES GARDNER**, who formerly attended Yale University, called to active service in the U. S. Army as a second lieutenant in the Cavalry Reserve; **JOHN N. GROMER**, formerly University of Colorado, now in the U. S. Army, Battery D, 14th Battalion, Fort Bragg, N. C.; **JOHN MARKELL, JR.**, USNR, formerly a student at Massachusetts Institute of Technology; **R. J. N. PITZEN**, graduate of University of Wisconsin, entering U. S. Army, Corps of Engineers, Officers Candidate School; **WILLIAM WARREN AIRD**, formerly Polytechnic Institute of Brooklyn, now an aviation cadet in the U. S. Army Air Forces at the University of California at Los Angeles; **JAMES H. BURFORD**, formerly Ohio State University, called for active duty in the Army Air Forces.

The following are SAE student members newly engaged in engineering work: **OWEN W. WELLES**, formerly Massachusetts Insti-

tute of Technology, now with Pratt & Whitney Aircraft, Division of United Aircraft Corp., East Hartford, Conn., as experimental test engineer; **ANDREW N. SMITH,** graduate of Ohio State University, now working for the General Electric Co., Erie, Pa., as a test engineer; **EUGENE SMITHBERG** graduated from College of the City of New York and working as a mechanical engineer for the Virginia Lincoln Aircraft Corp., Marion, Va.; **WALLACE J. LATCHEM,** graduate of University of Michigan, now design engineer for Noorduyn Aviation, Ltd., Cartierville, Que.; **ARNE V. LARSON,** formerly University of Wisconsin, now a test engineer for the General Electric Co., Schenectady, N. Y.; **NICHOLAS A. BEGOVICH,** graduate of California Institute of Technology, now with the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

A course in selecting, training, and maintaining fleet personnel in wartime, conducted by the Institute of Public Safety, will be held Sept. 13-18 at Pennsylvania State College. Among the speakers will be SAE members **AMOS E. NEYHART,** administrative head, Institute of Public Safety, Pennsylvania State College; **J. WILLARD LORD,** safety engineer, Atlantic Refining Co.; **W. J. CUMMING,** maintenance section chief, Office of Defense Transportation; and **C. G. MORGAN, JR.,** manager, Division of Operations, American Trucking Associations, Inc.

LIDIA MANSON, formerly research assistant, Engineering Experiment Station, Pennsylvania State College, is now research engineer, Clark Bros., Inc., Olean, N. Y.

ALFRED M. BECKER, Chandler-Evans Corp., has been made field engineer. He had been field service engineer.

2ND LT. WALTER S. FORTNEY, AAF, 77th Service Squadron, formerly Army Air Base, Hunter Field, Savannah, Ga., can now be reached at A.P.O. 528, c/o Postmaster, New York.

1ST LT. WILLIAM E. DORSEY, JR., AAF, formerly a clerk in the British Air Commission, Washington, is with the 63rd Ferrying Squadron, 2nd Ferrying Group, New Castle Army Air Base, Wilmington, Del.

Formerly vice-president and secretary of Winters National Bank & Trust Co., Dayton, Ohio, **GEORGE R. GASKELL** is now assistant to the president of the Leland Electric Co., in the same city.

E. K. RALSTON, formerly mechanical engineer with Republic Steel Corp. Steel & Tubes Division, has resigned from this company to organize the Ralston Engineering Co.

OBITUARIES

Thomas B. Lytle

Thomas B. Lytle, aged 54, died on July 9. At the time of his death, Mr. Lytle was assistant quality control manager of the Curtiss-Wright Corp., St. Louis, Mo.

Capt. A. C. Burgoine

Capt. A. C. Burgoine, of Koala, Hillburn, Henleaze, England, who served in the Royal Naval Air Service and the RAF in the last war, died recently. Before becoming manager of the Rodney Works of the Bristol Aeroplane Co., he and his wife traveled extensively on behalf of the company in Australia and Japan.

Harry P. Starr

Harry P. Starr, general superintendent of the Art Frost Co., Glendale, Calif., died July 16 at the age of 49. Mr. Starr was vice-chairman of the Passenger-Car Activity of the Southern California Section, and he was also on the Membership Committee of that Section.

Walter A. Roberts

Walter A. Roberts, educational director for New York, and also connected with the Allen Electrical & Equipment Co., Kalamazoo, Mich., died recently at the age of 49. Mr. Roberts was a member of SAE Transportation & Maintenance Committee 17.

Herbert W. Johnson

Herbert W. Johnson, president of H. W. Johnson & Co., Inc., Malden, Mass., died on May 22. Mr. Johnson, who had been an associate member of the SAE since 1928, was 58 years old.

Impact of War

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the Taft Amendment to the Emergency Price Control Act. Packages must show the amount of antifreeze required to a gallon of water to reduce the mixture's freezing point at —10 deg F, or supply a table with such data.

Tool Order

Regulation Seeking Data On Pooling Under Way

BITTERLY denounced by many industrialists but strongly supported by others and the War Production Board, the Component Scheduling Procedure may be entirely replaced by a new approach being written into a new machine tool order scheduling use of manufacturing equipment.

The CSP concentrated its attention largely on power equipment and its critical component parts as an effort to break production bottlenecks.

The proposed machine tool order:

- Would make machine tools, of over $500 in value and built after Dec. 31, 1931, available through a pooling arrangement. This part of the plan is similar to the machine tool service to the automotive industry supplied by the Tooling Information Service of the Automotive Council for War Production;
- Complete tool building programs where materials are available and would:
- Extend subcontracting more widely wherever possible to complete needed tools.

In its studies, the Machine Tool Division of WPB has concluded that information gained through this order will serve as an index to beginning production of civilian goods. However, the determining factor in this will continue to be the shortage of materials.

Metal working equipment involved will be:

- Forming and bending tools,
- Metal cutting, and
- Welding equipment.

It is proposed that the data will be collected by the Regional Offices of WPB, where most of the information will be used locally, and will also be collated in Washington to develop a national picture of inventories of idle machinery and more accurate knowledge of where the nation stands in respect to the entire machine tool program.

Saved

$3½ Billion Gained In Renegotiations

ARMY, Navy, and the U. S. Maritime Commission have reported a saving of $3,555,174,000 through the efforts of price adjustment agencies as of June 30, 1943.

This does not include estimated billions secured to the Government through successive lowering of prices of contracts during the past 14 months of the combined renegotiation program. Several times the measurable savings are estimated.

This $3½ billion figure represents the settlement of 3611 cases, but there are 7429 cases in progress and 3642 yet to be assigned as of June 30.

Of the $3½ billion, about $1½ billion represents recoveries and about $2 billion represents price reductions, the joint statement of the three agencies pointed out.

Breakdown:

	Recoveries (in millions)	Price Reductions (in millions)	Cases Settled	Cases In Progress
Army	$1,091	$1,407	2894	4796
Navy	388	581	626	2320
USMM	45	43	91	313

The work is being rapidly accelerated by all three agencies.

It was pointed out that the savings accruing through lower prices in successive contracts resulted from the inability of the contractor or the procurement officers to make accurate estimates of costs on the earlier contracts, due to lack of experience.

Renegotiation Law Changes Proposed

Chairman Wesley E. Disney of the subcommittee on contract renegotiation of the House Ways and Means Committee told the *SAE Journal* that his group would seek the opinions of Government contracting agencies and industry on changing the present law.

The four major points scheduled for investigation by his group are:

- Allowances for post-war reserves by manufacturing companies now holding Government contracts;
- Plant depreciation including depreciation and obsolescence of machinery and manufacturing equipment;
- Should renegotiation be made before or after taxes, and
- Amortization of values of manufacturing companies.

Hearings of the Ways and Means Committee, of which Robert L. Doughton is chairman, are scheduled to begin Sept. 9, a week before Congress reconvenes.

It was pointed out on Capitol Hill the aircraft industry will be the focus these studies, in view of its infancy as large manufacturing industry and its p war problems.

More Materials

ODT Gets Increases For Automotive Replacement

OFFICE of Defense Transportation, Claimant Agency for obtaining allocations of materials for the domestic automotive and other transportation facilities obtained large increases for the fourth quarter as compared with the third from the WPB Requirements Committee.

The amounts, for automotive replacement with percentage increases over the third quarter are:

MATERIAL	4th Quarter Allocation	% Increase Over Quarter
Carbon Steels	88,000 tons	150
Alloy Steels	41,687 tons	164
Copper Base Alloys:		
Sheet & Strip	4,608,713 lb	284
Rod, Brass & Wire	1,538,146 lb	22[illegible]
Tubes & Piping	425,000 lb	24[illegible]
Foundry Products	1,957,000 lb	350

An amount of unalloyed copper w 219% greater than the third-quarter allotment was obtained, as well as an increase of 210% of copper wire. Aluminum castings are up 155%.

Heretofore all automotive materials requests have stemmed from the Automotive Branch. ODT is handling domestic requirements only.

Welding Gages Are Simplified

Limiting the size of welding apparatus gages to 2 and $2\frac{1}{2}$ in. dial sizes, standardizing the sizes, and prohibiting the practice of putting the customer's name on the instrument, are counted upon to increase production by 15 or 20%, WPB estimated upon the issuance of Schedule VI of Limitation Order L-272 (Aug. 6). A manufacturer of complete apparatus may, however, put his own trademark or name on the dial.

Pressure ranges (in lb) 0-30; 0-60; 0-10 0-200; 0-400; 0-600, and 0-300.

Simplication of case material and finish are prescribed in the order.

Eases Steel For Tests

Manufacturers may obtain 1000 lb of any one steel composition or 3000 lb of all compositions for testing, except stainless, tool and casting alloys, Amendment No. 2 CMP Regulations No. 1 (Aug. 4) states.

Sample order delivery requirements for testing purposes of all other controlled materials, including stainless, tool, and casting steels, are still limited to 1% of the minimum mill quantity (Schedule IV, CMP Reg. No. 1).

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